

TOMIX TNOS SYSTEM
Notes in English from the 5701 Basic Set Manual with Added Comments
By Richard D. Kerr
Revised 2020-07-28

Use alongside the Tomix Japanese manual which can be found at
www.tomytec.co.jp/tomix/necst/5701tnos/images/5701_manual.pdf)

Excerpted Notes [with added comments in square brackets]

Pg. 1 top	[the usual consumer product cautions ... do not short-circuit between rails. Each device may generate heat. When derailed, please turn off the power immediately. Be sure to unplug the plug or AC adapter from the outlet when not driving. Please keep the manual and package.]
Pg. 1 mid. left	[product handling advice: Handle carefully, connect correctly. Don't overload. Turn power off on all devices when attaching or detaching a connector. Hold connector body and do not pull by the wires. Turn power off on all devices when placing a train on the track. Uses metal train wheels for detection. Do not expose to sunlight. Do not store in places with high temperature, dust or dampness. Keep train wheels and rails clean and free of oil. Do not operate trains wildly, etc.]
Pg. 1 mid. right	The SD Memory Card included with this product is for the Control Unit T-CU01 only. Do not use the memory card in other equipment. The Memory Card has a protect switch; to prevent erroneous erasure. Keep this switch in the "lock" position [down].
Pg. 1 lower	[table of contents] [Follow the "Refer to . . ." notes below instead.]
Pg. 1 bottom	[basic description of TNOS system: Control Unit, ND Hub, gapped rail blocks, sensors, Points (track switches/turnouts) control, no DCC installations required, 10 dedicated layout plans each with multiple pre-programmed automatic operating sequences.]
Pg. 2 top	[Figures showing block-based automatic train operation: Without a preceding train (upper figure): <ol style="list-style-type: none">1. A train runs at its set maximum speed. Note that empty blocks are normally unpowered.2. When detected at a sensor, a train "claims" the next track block ahead, which gets set to matching polarity and speed parameters. The block behind is released and de-powered. With a preceding train ahead (lower figure): <ol style="list-style-type: none">1. A train runs at its set "green signal" speed if 3 or more blocks behind the train ahead.2. A train runs at its "yellow signal" speed if 2 blocks behind (after being detected at sensor).3. A train stops if 1 block behind the train ahead (after being detected at sensor).4. A train re-accelerates when the block ahead is released by the train ahead.]

5701 TNOS Basic Set Contents

Note: Refer to Figure 1 on manual page 2 at bottom.

Control Unit T-CU01	1	Terminating Resistor	1
ND Hub T-ND100	1	Insulated (gap) Rail Joiner	20
(with Points Driver (turnout) (T-DVP01)	4	Rail Joiner Exchange Tool	5
and Feeder Driver (track power) (T-DVF02)	4	Label Sticker Sheet	1
SD Memory Card	1	5701 TNOS Basic Set Manual	1
AC Power Adapter	2	Basic Connection Guide (large fold-out)	1
Communication Cable	1	Warning Statement Sheet (yellow)	1

[Note: An errata correction sheet for layout cabling may also be included in the 5701 TNOS Basic Set.]

[**Warning!** The Terminating Resistor, sealed in a small clear bag with the sprues of rail joiners and tools, is an important part of the TNOS system. It is so tiny that it is very easy to lose. I recommend keeping it plugged into the appropriate ND Hub receptacle, and being vigilant over time in checking that it is still there.]

Tomix TNOS T-CU01 Control Unit Features

Note: Numbers refer to the drawing of the Control Unit (Figure 2) on manual page 3 at top.

1 Power Switch

Push top of switch to turn the Control Unit on; push bottom of switch to turn it off.

2 Power Indicator

LED will light green when the Control Unit power is turned on. When an overload is detected, power is shut off and the LED will light red.

3 Control Keypad

This keypad is used to initiate various operations such as selection of Layout Plan, Automatic Operation sequence, parameter settings, etc. [more details below]

4 Dial

Used to select numerical values for control options chosen with a Control Unit Keypad button, to select which train's speed and signals to display, and to control the speed of a train during Manual Intervention.

5 Display

Displays various information such as numerical value and setting entered, speed and condition of a running train, etc.

6 Manual Intervention Light

Lights yellow during manual operation of a train. [See page 7 below.]

7 Green Signal

Lights while the train with the displayed number can run at maximum speed during Automatic Operation.

8 Yellow Signal

Lights while the train with the displayed number runs under reduced speed during Automatic Operation.

9 Stop Signal

Lights red when the train with the displayed number is receiving a stop instruction during Automatic Operation, and when "tnoS" is displayed before and after an Automatic Operation.

10 Brake Operation Light

Lights red while the train with the displayed number is decelerating during Automatic Operation.

11 Memory Card Slot

The included SD Memory Card must be inserted into this slot [before unit is turned on. Do not store in unit.]

12 DC Power Input

The supplied AC power adapter plugs into this socket.

13 TCS Power Output

Power supply for TCS products like signals, automatic crossing, etc.

14 Communication Port A

The included Communication Cable plugs in here.

15 Communication Port B

Communication port for expansion. This product is not used alone. [Not used at this time]

16 12C Port

Terminal for extending the 12C port. This product is not used alone. [Not used at this time] This is a pin for extending the serial communication port.

17 Serial Communication Port

This is a pin for extending the serial communication port. [Not used at this time]

18 Smartphone Stand

It is possible to place a smartphone or similar device here.

[Figure 5 on manual page 4 has more information on the Smartphone Stand:

How to Use the Stand

The stand part of the Control Unit is designed to be able to hold a smartphone or similar device, which can be enjoyed with the Tomix 5594 In-Vehicle Camera System Set (E233-3000 series). You can adjust the position of the stand (see Figure 5). When adjusting the stand position, slide it as shown in the illustration and adjust it to your preferred position. Make sure to slide it with both hands, keeping it parallel to the original position.]

Tomix TNOS T-ND100 Hub Features

Note: Numbers refer to the drawing of the ND Hub (Figure 3) on manual page 3 at bottom.

1 Power Switch

Push left side of switch to turn ND Hub on; push right side of switch to turn it off.

2 Power Indicator

LED will light green when Control Unit power is turned on. When an overload is detected, power is shut off and the LED will light red.

3 Sensor Connections (S1 to S8)

Connect each sensor cable to the appropriate “S” input port number.

4 Communication Ports A

Connect the included Communication Cable(s) here.

5 Track Power Feeder Connections (F1 to F4) (Driver for Feeder)

Connect each DC Track Feeder cable to the appropriate “F” output port number.

6 Electric Point (Turnout) Connections (P1 to P4) (Driver for Points)

Connect each electric Point (track switch or turnout) cable to the appropriate “P” output port number.

7 DC Power Input

The supplied AC power adapter plugs into this socket. [Identical adapters are used for CU01 and ND100].

8 TCS Power Output

12 V DC Power supply for TCS products like signals, automatic crossing, etc.

9 Communication Port B

Terminal for Communication Port B expansion. This product is not used alone. [Not used at this time]

10 12C Port

Terminal for extending the 12C port. This product is not used alone. [Not used at this time]

11 Terminating Resistor Socket

This is a socket for inserting the Terminating Resistor. [See my warning at bottom of Page 1 above.]

Excerpted Notes [with Comments]

Manual, Pg. 4 top [a **list of products** that can be used with the TNOS System (ND Hub, sensors, feeders, cables)]

Pg. 4 bottom [shows application of **label stickers** to cables, ND Hub; Smartphone Stand (see Page 2 above)]

Pg. 5 top [**Overview of Preparation Steps** (refer to following pages below for details):

1. Choose a Layout Plan to construct.
2. Prepare the required materials (track pieces, sensors, track feeders, gap insulators, etc.) A table of the needed quantities for each Layout Plan is provided below. The diagrams for each Layout Plan must be followed exactly, in order to operate properly.
3. Assemble and cable the tracks. Refer to the diagram. Install items in the correct position and orientation.
*If fastening the tracks to a layout board etc., perform Test Operation before fastening.
4. After initial assembly of the track and cabling, select the Automatic Operation sequence “Test Operation” [a one-train sequence shown within a separate box in the documentation] to test the operation of the layout. If it does not work properly, check the position of the gaps and cabling, then re-run the Test Operation until successful.
5. After the Test Operation completes without any problem, enjoy using other Automatic Operation sequences. *It is also possible to set detailed train operating parameters; please set them, referring to the explanations starting on manual page 13.]

Pg. 5 top right [**SD Memory Card**: Insert in the Control Unit with proper orientation. Push it all the way in until a “click” sound is heard, after which the card will rebound slightly. To remove, press it in lightly until a “click” sound is heard, then it will come out a little and can be removed. *When storing the Control Unit in its box, remove the card first and store it. *Do not lose the memory card. *Do not insert anything other than the included memory card. *Insert the memory card before turning on the power; remove it only after turning off the power.]

Pg. 5 lower	[table of quantities: columns are Layout Plans 1 to 10, rows show required number of ND Hubs, DC Feeders, Points (right, left, double crossover), sensors and insulated gap joiners.]
Pg. 5 bottom – 6	[layout plans 1 to 10: general plans showing track Block section numbers and sensors.]
Pg. 6 bottom	[typical train motor and lighting current needs: the general Tomix chart.]
Pg. 7 top	[track block lengths: Blocks must be long enough to fit longest train operated between entry gap and sensor, and for all trains to come to a stop before the exit gap and the next block.]
Pg. 7 lower	[How to remove metal rail joiners and replace with insulating gap joiners; you can use the G70 insulated gap straight track piece instead.]
Pg. 7 bottom	[gap installation at Points: normally on both branching routes of points; with Tomix Full Selection points you can alternately install a gap at the root end of the points.]
Pg. 8 top	[reversing travel direction on an oval layout: The figures show that reversing the orientation of all DC Track Feeders will reverse the direction of operation. Note relocation of sensors. Note parallel passing tracks retain block numbers based on Points straight and curved routes.]
Pg. 8 middle left	DC Track Feeder Installation [. . .] Because the DC Track Feeder can be inserted from either side of the track piece, carefully check the wiring diagram of the desired Layout Plan and pay attention to the insertion orientation. If you make a mistake, the polarity reverses and the direction of travel will also be reversed. Normal operation will not be carried out, and also derailment and electric short-circuit may occur, which may cause a malfunction or unexpected accident.
Pg. 8 bottom	[under-track power feeder installation: The figures show how to orient newer Tomix under-track feeders so that they will match polarity with the traditional feeder. (My “ L ” mnemonic: orient them so that the wires L eave the clip-on box on the same side as the L eft side (the L ong prong side) of the traditional slide-in power feeder.)]
Pg. 9 top	[TCS Sensor Location: (Figure 13) Sensor Mounting Position 1 – When running two or more trains at one time, if there is a train in the next block ahead, it is necessary to stop the following train after the detection sensor but before the insulating gap between the blocks. Therefore, when installing the sensor, leave the necessary distance between sensor and gap, as shown at right. Sensor Mounting Position 2 – Locate the sensor toward the “outbound” end of each block. Depending on the plan, if trains will run in both directions in a block, more than one sensor will be needed in that block. Note that sensors can be inserted into track from either side, and can use either cable socket.]
Pg. 9 bottom	[standard Tomix info on placement and cabling of 5573 and 5558 TCS sensors.]
Pg. 10 top	[standard Tomix info on installation of 5567 TCS sensor.]
Pg. 10 middle	[application table showing which TCS sensors can be used with which Tomix track types.]
Pg. 10 bottom	[Relationships between malfunction of operation and sensor [important for troubleshooting]: 1. [top half of figure] A train enters the next block and stops suddenly, but there is no train ahead and the block does not have a “Red” signal. If this occurs, it may be a case of sensor malfunction. Double check the sensor installation and wiring. The last sensor did not detect the train, and as a result no power has been directed to the next block. 2. [bottom half of figure] A train stops normally after detection by a sensor, but there is no train in the block ahead. The sensor in the block ahead may have malfunctioned in a “constantly detecting” manner. Check the sensor in the block ahead, or try replacing it.]
Pg. 11 top	[General control cabling scheme (Figure 17) shows AC power cords and Communication Cable connections for a Control Unit and one ND Hub. Note insertion of Terminating Resistor in ND.]
Pg. 11 bottom	[Cabling of ND Hub (Figure 18) shows Sensor, Feeder and Point receptacles. Note that the Feeder Driver and Points Driver “bricks” are removable, and they have “keyed” socket and cable plug shapes to prevent cross-insertion of one type of cable into the other type “brick.”]
Pg. 12 top	[ND Hub Expansion (Figure 19) shows multiple ND Hubs “daisy-chained” by Communication Cables. Note insertion of Terminating Resistor in the final ND Hub. ND units are set as address number “1” by default. With multiple ND units, it is necessary to change each address after the first unit. Refer to manual page 17 and make any necessary ND Hub address changes.]

Tomix TNOS Control Unit Keypad

Note: Refer to Figure 20 on manual page 12. [The keypad keys are numbered in red below for reference.]

1 Select Layout Plan

Used to select a Layout Plan number. Pressing the button during Automatic Operation displays the number of the current Layout Plan.

2 Set Signals

Temporarily not used at present. [future enhancement]

3 Select Pulse Frequency

Used to change, if desired, the frequency of the motor control pulse.

4 Setup

Used when needed to change the address of an ND Hub unit.

5 Select Automatic Operation

Used to select an Automatic Operation sequence number for the chosen Layout Plan. Pressing the button during Automatic Operation displays the number of the current Automatic Operation.

6 Set Automatic Operation Time

Optionally used to set a time duration for an Automatic Operation. Pressing the button during operation displays the remaining time.

7 Set Repetitions

Optionally used to set the number of repetitions of an Automatic Operation sequence. Pressing the button during operation displays the remaining number of repetitions.

8 Display Speed

Returns the Display to the selected train's speed, after displaying remaining duration, repetitions, etc.

9 Select Operating Parameter Set

Used to assign an Operating Parameter Set (speeds, acceleration rates, etc.) number to the selected train.

10 Customize Operating Parameters

Used to edit the individual parameters of a customizable Operating Parameter Set [sets 1 – 10 only].

11 Copy Parameter Set

Can be used to copy one train's chosen Operating Parameter Set to other train numbers.

12 Enter

Acts like a computer's "Enter" button to confirm and "lock in" a Layout Plan number, Automatic Operation sequence number, parameter, etc., after using the Control Keypad buttons and then the Dial.

13 Emergency Stop

Shuts off power supply to the track. Stops all trains in an emergency while in Automatic Operation.

14 Pause

Temporarily stops the trains. The Constant Lighting of trains remains on.

15 End Operation

Ends an Automatic Operation sequence at its next logical "end state," cancelling any remaining set Automatic Operating Time duration or Repetition count setting.

16 Run

Starts the chosen Automatic Operation on the chosen Layout Plan, resumes operation after a Pause, or resumes automatic control of a train's speed after a Manual Intervention of that train's speed control.



Operation of the TNOS Control Unit

Test Operation [Refer to page 13, left side]

When all setup and cabling is completed, perform the Test Operation first to check whether everything is correct. Setting up a Test Operation is carried out using the following procedure.

*Test Operations are performed with only one train.

*If the Test Operation sequence is not completed successfully, there may be problems with wiring, etc. Check it again. To determine the Test Operation number for each Layout Plan, please refer to manual pages 18 - 34.

[Refer to Figure 21]

- 1 **Plug Control Unit and ND Hub** into electrical outlets.
- 2 **Place a train on the track** (one train only) at the "Train 1" position shown on the selected Layout Plan.
*Please refer to the Layout Plan figures starting on manual pages 18 – 34.
- 3 **Turn on HD Hub(s) and then the Control Unit.** [Power indicator lights should light green.]
- 4 **Press the Select Layout Plan button** on the keypad. ["L" will be shown on left side of the Display.]
- 5 **Turn the Dial to the proper Layout Plan number.**
*For example, to select Layout Plan 4, turn dial so that "4" is shown on the Display.
- 6 **Press the Enter button.**
A decimal point will light up after the selected number on the Display to confirm it has been entered.
- 7 **Press the Select Automatic Operation button.** ["A" will be shown on left side of the Display.]
- 8 **Turn the Dial to the Test Operation sequence number.** [Refer to the manual.]
- 9 **Press the Enter button.**
A decimal point will light up after the selected number on the Display to confirm it has been entered.
- 10 **Press the Run button.**
*Test running of the train should begin.

When the Test Operation sequence is completed, "tnoS" will appear on the Display again.

Automatic Operation [Refer to page 13, right side]

[Note: Essentially the same as the steps above, except that you can choose any Automatic Operation sequence for the constructed Layout Plan, and you must place and run as many trains as the chosen sequence requires.]

After completing a successful Test Operation, you can run trains by selecting an Automatic Operation sequence for the Layout Plan. Setting up an Automatic Operation is carried out using the following procedure.

*For each Layout Plan and Automatic Operation sequence, refer to manual pages 18 – 34.

[Refer to Figure 22]

- 1 **Plug Control Unit and ND Hub** into electrical outlets. [Place trains on track where indicated on Layout Plan.]
- 2 **Turn on HD Hub(s) and then the Control Unit.** [Power indicator lights should light green.]
- 3 **Press the Select Layout Plan button** on the keypad. ["L" will be shown on left side of the Display.]
- 4 **Turn the Dial to the proper Layout Plan number.**
* For example, to select Layout Plan 4, turn dial so that "4" is shown on the Display.
- 5 **Press the Enter button.**
A decimal point will light up after the selected number on the Display to confirm it has been entered.
[There is no Step 6.]
- 7 **Press the Select Automatic Operation button.** ["A" will be shown on left side of the Display.]
- 8 **Turn the Dial to the desired Automatic Operation number.**
*For example, to select Automatic Operation sequence 2, turn dial so that "2" is shown on the Display.
- 9 **Press the Enter button.**
A decimal point will light up after the selected number on the Display to confirm it has been entered.
- 10 **Press the Run button.**
*Each train will start running according to the selected Automatic Operation sequence.

When you operate normally, each train will run according to the sequence and finally return to its original position and stop. "tnoS" will appear on the Display again, after the Automatic Operation sequence is completed.

Stopping a Train [Refer to page 14, top left]

There are two ways to stop a train while running in Automatic Operation. Refer to the procedures below.

[Refer to Figure 23]

Emergency Stop

Stops all operations in an emergency while in running mode. Track power is turned off.

*When you press the Stop button, “StoP” appears on the Display.

When you press the button, trains stop immediately. To resume driving again, it is necessary to return each train to its start position corresponding to the selected Layout Plan and Automatic Operation sequence.

*The setting of the Layout Plan and the Automatic Operation needs to be done again.

Pause

Pauses operations temporarily. Power remains on and the Automatic Operation sequence is retained.

Operations can be resumed.

*When you press the Pause button, “PAUS” appears on the Display.

Press the **Run button** to resume the Automatic Operation sequence from the point at which it was paused.

Manual Intervention [Refer to page 14, lower left]

You can manually control the speed of any train while running in an Automatic Operation. Speed is still limited if the train is in a limited-speed “Yellow” signal condition, and the train will stop if in a “Red” signal condition.

[Refer to Figure 24].

While running in Automatic Operation:

- 1 Select the train** you want to manually control using the Dial.
- 2 Press the Enter button.** The Manual Intervention Light will light yellow. The train number and current speed number will be shown in the Display.
- 3 Turn the Dial** to control the speed manually. Automatic limited-speed Yellow and stopping remain in effect.
- 4 Press the Enter button** again to cancel Manual Intervention. The Manual Intervention Light will go off.

*Automatic Operation will resume.

Set Operation Time [Refer to page 14, top right]

You can optionally set a duration time for continuous operation. The Automatic Operation will end as soon as the program cycle is completed after the desired duration time has been reached.

*It may take time to stop depending on the chosen operation, until the program reaches an “end state.”

*When both Operation Time and Repetitions are set, the one reached first will have priority.

[Refer to Figure 25]

- 1 Press the Set Operation Time button** after selecting an Automatic Operation sequence. [Display will show “0.00”]
- 2 Turn the Dial** to the desired number of minutes.
- 3 Press the Enter button.**

A decimal point will light up after the number of minutes on the Display to confirm it has been entered.

- 4 Turn the Dial** to the desired number of seconds.

- 5 Press the Enter button.**

A decimal point will light up after the number of seconds on the Display to confirm it has been entered.

Note: The maximum possible setting is 99 minutes and 59 seconds.

See Remaining Operation Time

- 1 Press the Operation Time button** during Automatic Operation.

The remaining Operation Time will be shown in the Display.

- 2 Press the Display Speed button** during Automatic Operation to return to showing the speed in the Display.

Cancel Remaining Operating Time

Press the **End Operation button**.

*It may take time to stop depending on the chosen operation, until the sequence reaches an “end state.”

Set Repetitions [Refer to page 14, lower right]

You can optionally set a number of repetitions for the Automatic Operation to execute continuously.
[Refer to Figure 26-1]

- 1 **Press the Repetitions button** after selecting an Automatic Operation sequence. [Display will show “r.” and a number.]
- 2 **Turn the Dial** to the desired number of times (from 1 to 255 times).
*For example, to select 15 times, turn dial so that “15” is shown on the Display.
- 3 **Press the Enter button.**

A decimal point will light up after the selected number on the Display to confirm it has been entered.

See Remaining Number of Repetitions

[Refer to Figure 26-2 on manual page 15 top left]

- 1 **Press the Repetitions button** during Automatic Operation.
The number of repetitions remaining will be shown in the Display.
- 2 **Press the Display Speed button** during Automatic Operation to return to showing the speed in the Display.

Cancel Remaining Repetitions [Refer to page 15, top]

Press the **End Operation button**.

*It may take time to stop depending on the chosen operation, until the sequence reaches an “end state.”

Forwarding Mode [Refer to page 15, middle and bottom]

Forwarding Mode is a mode in which a train can be moved according to a manually set route. You can move a train to a selected position (for example a siding) using the Dial. Refer to Figure 27.

- 1 **Press the Select Layout Plan button** and select the appropriate Layout Plan using the Dial.
*For details see manual page 13.

- 2 **Press the Select Automatic Operation button.**

- 3 **Turn the Dial to 0.**

*In all Layout Plans, Automatic Operation 0 is the Forwarding Mode.

- 4 **Press the Enter button.**

For example, Train 1 has been stopped using Emergency Stop. We will move it from S1-3 to S1-1 [via S1-4].

- 1 **Set the origin block** (block sensor number) [indicated as 0 in the left half of the Display].
*In this example the train is in S1-3, so use the **Dial to select 1.3** and **press the Enter button**.
*In cases where the number chosen is not logical, the [right-most] decimal point in the Display will not light.
*Do not select a block where another train is already present.
- 2 **Set the next block to move to** [indicated as Point 1 in the left half of the Display]. [1st destination block]
*In this example S1-3 is followed by S1-4, so use the **Dial to select 1.4** and **press the Enter button**.
- 3 **Set the next block to move to** [indicated as Point 2 in the left half of the Display]. [2nd destination block]
*In this example S1-4 is followed by S1-1, so use the **Dial to select 1.1** and **press the Enter button**.
- 4 **Press the Run button** after all of the destination blocks in the sequence have been entered in this way.
In this example Train 1 will move from “1-3” to “1-4” to “1-1”.

When the train direction needs be reversed in Forwarding Mode [bottom of Figure 27]

For example, moving from S1-2 to S1-3 and back to S1-2.

1. **Set the origin block** [use Dial and Enter button; this example shows in the Display as “0. 1.2.”]
2. **Set the next block (the reversing block)** [use Dial; this example shows in the Display as “1. 1.3”]
3. **Press Enter Twice** to set the reversing location [Display shows this example as “1. 1.3.”]

[Note: Pressing Enter twice has since been eliminated in TNOS Update 2019-02. Refer to my update notes.]

4. **Set the next block** [use Dial and Enter button; this example shows in the Display as “0. 1.2.” again]
5. **Press the Run button.** Train 1 will move from “1-2” to “1-3”, then reverse from “1-3” back to “1.2”.

Example: You want to stop a train that is reversing from S1-3 to S1-2 within the passing siding block. Because a train entering from the opposite direction [than the normal operation direction] will stop when it is detected by a sensor, it will [or “might”] come to a stop partially occupying Block 3. In order to have the train stop fully within the passing siding (Block 2), set “S1-4” as a [final] moving point, then select Manual Intervention after the train starts to move. Then manually stop the train wherever you like within Block 2. After stopping, press the Emergency Stop button to end the operation.

Pulse Frequency Setting [Refer to page 16, top]

It is possible to change the frequency of the track power pulses. Setting the frequency low enables a slower and smoother operation. However, due to the characteristics of the equipment, abnormal noise and running speed change may occur, and the lights may flicker [at low frequency]. You can optionally set the frequency as you like. Note: Refer to Figure 28. [Note: I suggest generally keeping the pulse frequency at its default setting of 200 Hz unless there is some necessity to change it.]

1 Press the “Select Pulse Frequency” button.

2 Turn the Dial to select a frequency.

*The default setting is 200 Hz. [which is in the “low” range. Choices go from 20 Hz to 20,000 Hz.]

3 Press the Enter button.

*The speed of the train can be adjusted using the Customize Operating Parameter Set button.

Train Operating Parameter Sets [Refer to page 16, middle]

Depending on the type of train and manufacturer, individual differences in performance characteristics can occur. A defined operating Parameter Set can be selected, with detailed settings for maximum speed, acceleration rate, deceleration rate, etc. In addition, sets 1 – 10 can be customized and adjusted.

Note: Refer to table.

Table of Operating Parameter Sets

<u>Setting</u>	<u>Corresponding Train Types</u>
0 (default)	Most trains (default setting; uses 200 Hz pulse frequency)
1 – 10 (customizable)	Individual parameter values can be adjusted (see Pg. 18 for details) *1
11 (for lightweight cars) (low)	Motorized iron gauge trains at low frequency setting, etc.
12 (for general cars) (low)	Common trains, diesel cars, etc. at low frequency setting
13 (for low-weight cars) (low)	Electric locomotive at low frequency setting, long train, etc.
14 (for the camera car) (low)	Compatible with 5594 in-train camera car E233-3000 Series, etc. *2
15 (for light cars) (high freq.)	Motorized iron core trains, etc. at high frequency setting, etc.
16 (for general cars) (high freq.)	General train, dashi car, etc. at high frequency setting
17 (for weight cars) (high freq.)	Electric locomotive at high frequency setting, long train, etc.

Notes for table:

*1: For “1 – 10” it is possible to set parameters to your preferred values. [They start at Set 0’s default settings.]

*2: Set the camera car to 200 Hz or more.

*Parameters in Parameter Sets “0” and “11 – 17” are fixed values and cannot be customized.

*Sets shown as “(low)”: Suitable frequency settings are 25 Hz, 50 Hz, 100 Hz, 200 Hz, 400 Hz and 800 Hz.

Sets shown as “(high)”: Suitable frequency settings are 2,000 Hz [“2E3”] and 20,000 Hz [“2E4”].

*The train type descriptions in the right column of the table above are general examples. It may vary depending on the driving environment and individual train differences.

Assigning an operating Parameter Set to a train [Refer to page 16, bottom]

An operating Parameter Set can be assigned to each train. Refer to Layout Plans on manual pages 18-34, check the starting position and train number of each train, and refer to Figure 29 as a reference.

*Use the start position number of each train, and set an Operating Parameter Set number to each desired.

Note: Refer to Figure 29-1.

1 Press the “Select Operating Parameter Set” button.

2 Turn the Dial to select a train.

3 Press the Enter button.

*For example, to select train number 2, set [number on left side of Display] to “2”.

*A decimal point will light up after the selected number on the Display to confirm it has been entered.

4 Turn the Dial to select the Parameter Set you wish to assign to this train.

*For example, to select Parameter Set 1, turn the Dial so that “1” is shown on the right side of the Display.

5 Press the Enter button.

*A decimal point will light up after the selected number on the Display to confirm it has been entered.

To set the same operating Parameter Set number for all trains [Refer to page 16, Figure 29-2]

- 1 Press the “Select Operating Parameter Set” button.
- 2 Turn the Dial to the left to display “AL [for “all”] and Press the Enter button.
- 3 Turn the Dial to select the desired Parameter Set number.
- 4 Press the Enter button.

*A decimal point will light after the selected number on the Display to confirm it has been entered.

Copy Parameter Set (Refer to page 16, very bottom right]

Used to copy the contents of an operating Parameter Set to another operating Parameter Set number.

* “Destination” sets that can be copied to are the customizable sets 1 – 10 only.

Note: Refer to Figure 30-1.

- 1 Press the Parameter Copy Button. [The left side of the Display will show “Pc” for “Parameter copy”]
- 2 Turn the Dial to select the source operating Parameter Set number, then Press the Enter button.

Note: Refer to Figure 30-2 [page 17, top.

- 3 Turn the Dial to select the destination operating Parameter Set number.
- 4 Press the Enter button.

*A decimal point will light after the selected number at right side of Display to confirm it has been entered.

Customizing Operating Parameter Sets 1 – 10 [Refer to page 17, middle]

Trains can have individual differences, performance characteristics, etc., depending on the type of vehicle, time of manufacture, etc. It is possible to fine-tune train operations by customizing individual parameter values.

Table of Individual Operating Parameters

No.	Name	Range	Default *1	Notes
1	CL Voltage	0-100	0	Sets a minimum pulse width, for Constant Lighting to work when stopped.
2	Start Voltage	0-100	10	Sets initial startup voltage. The higher the value, the higher the voltage.
3	Yellow Speed	0-100	15	Sets top speed when running under a Yellow signal. Higher value = faster.
4	Green Speed	0-100	25	Sets top speed when running under a Green signal. Higher value = faster.
5	Accel. Rate	0-255	30	Sets acceleration rate. The higher the value, the quicker the acceleration.
6	Decel. Rate	0-255	40	Sets deceleration rate. The higher the value, the quicker the deceleration.
7	Red Decel.	0-255	160	Sets Red signal deceleration rate. Higher value = quicker stopping.
8	Start Delay	0-255	10	Sets Start Delay after signal changes from Red. Higher value = longer delay.
9	Stop Time	0-255	10	Sets Stop Time value. The higher the value, the longer train stays stopped.

*“10” = about 1 second, “100” = about 10 seconds, “255” = about 25 seconds. *2

Notes for table

*1 The initial setting values will be the initial values in Parameter Sets 1 to 10 [which match default Set 0].

*2 The set time will be +3 seconds when wrapping [to a next repetition of the operating sequence]

Table of individual parameter values within each operating Parameter Set

[This is a table I have added from reading out the values on the Control Unit display. It is not in the manual.]

Set	Lights	Start	Yel.	Grn.	Accel.	Decel.	Red	Delay	Stop	Notes
0	0	10	15	25	30	40	160	10	10	Default Operating Parameter Set
1-10	0	10	15	25	30	40	160	10	10	Default settings before customization
11	10	3	8	15	10	12	50	30	30	(11-17 see Parameter Set table above)
12	11	3	10	18	12	14	55	30	30	
13	12	3	12	20	12	14	60	30	30	
14	11	5	18	33	22	25	101	30	30	For in-train camera car
15	10	5	14	27	18	22	92	30	30	
16	11	5	18	33	22	25	101	30	30	Same as 14
17	12	5	22	37	22	25	111	30	30	

How to change individual operating Parameters [Refer to page 17, bottom left]

Note: Refer to Table 31.

1 Press the “Customize Operating Parameters” button.

2 Turn the Dial to select the desired Parameter Set to be edited.

*Possible set numbers are 1 to 10.

3 Press the Enter button.

*The selected Set number will be shown on the left side of the Display, with the following decimal point lit.

4 Turn the Dial to select the Parameter number that you want to change. [1 – 9]

*Example shows changing the maximum speed (4) [Green speed], shown on the left side of the Display.

5 Press the Enter button.

*A decimal point will light up after the selected Parameter number on left side of the Display.

6 Turn the Dial to select the numerical value, shown on the right side of the Display.

7 Press the Enter button.

*A decimal point will light up after the selected value on the right side of the Display.

[Repeat Steps 4 – 7 for each Parameter you want to change. To skip a Parameter, just dial past it.]

*The operating Parameter Set you have customized must be assigned to a train, after you adjust it, in order to see the result. Refer to “Assigning an operating Parameter Set to a Train” above. [When done changing Parameters, simply go to your next action.]

Speed-Matching Trains [This section has been revised; none of this is in the manual.]

[You can generally match the operating characteristics of various trains to each other, so they will operate together and follow one another more smoothly. To do this, customize operating Parameter Sets 1 to 10, designing each set’s values around a particular train type. For example, I run trolleys and trams, and “speedy” powered Tomytec trams and small electric EMU’s simply cannot run at the same settings as “normal” Modemo or “slow” German Arnold Duewag GT6 trams, but with speed matching it can be done.

[First determine a reasonable running speed. I use Manual Intervention while in the Test Operation sequence to vary the speed and choose a speed setting number. I similarly find a speed setting number where the tram comes to a stop, but the lights stay on (Parameter 1). I test several trams of each type, and test each in both directions, because speed variations occur even within the same model type. Next, examine whether your Layout Plan and Automatic Operation will have trains running mostly under “Green” or “Yellow” signal conditions. Generally, trains follow one another and move under “Yellow” conditions, but trains moving in alternating directions may see more “Green” time. If “Yellow” time predominates, set Parameter 3 (“Yellow” speed) to your chosen speed and make Parameter 4 slightly higher, to permit catching up without looking too fast. If “Green” time prevails, set Parameter 4 (“Green” speed) to your chosen speed and make Parameter 3 somewhat slower. I choose “rate” Parameters by trial and error. With trams, quick acceleration, deceleration and stopping are prototypical and keep things moving on the layout. I set the “Red” stop rate to be not too abrupt, but to stop a tram within one car length so it stops partly over the sensor. I set the start voltage to avoid delay in starting, but not so high that the tram starts abruptly. I minimize the startup and stop times, again to keep the layout moving.

[As an example, here is a table of the current customized sets 1-6 that I use for tram and trolley types:

	1	2	3	4	5	6	7	8	9	
Set	Lights	Start	Yellow	Green	Accel.	Decel.	Red	Delay	Stop	Notes
1	5	6	12	14	8	15	20	0	20	Tomytec trams and small EMUs (Japan)
2	3	10	28	32	20	20	90	0	20	Modemo trams (Japan)
3	0	30	40	45	30	25	120	0	20	Original Arnold Duewag GT6 (Germany)
4	0	10	30	40	30	20	70	0	20	Hodl Linie 8 Siemens Combino (Germany)
5	3	4	20	36	25	20	150	0	20	Bachmann Peter Witt with DCC (USA)
6	2	6	21	23	15	10	20	0	20	Kato/Lemke 2-axle trams (Japan)]

Setting the Address of an ND Hub [Refer to page 17, bottom right]

Used to set an ND Hub address. With multiple ND Hubs, you need to set sequential ND Hub address numbers.

Note: Refer to Figure 32.

*The initial address number setting of every ND Hub is “1”.

*It is also possible to check the currently set address number of an ND Hub.

*When performing this set-up, do not connect more than one ND Hub [to the Control Unit].

1 Connect the ND Hub whose address is to be changed with a Communication Cable [to the Control Unit] and turn on the power of the ND Hub.

*Do not turn on the power of the Control Unit.

2 While pressing the “Setup” button, turn on the Control Unit. [The display will show “CnFG”.]

3 Press the “Select Operating Parameter Set” button.

*The display will show “nd” and the currently set ND Hub address number.

4 Turn the Dial to select the desired address number.

5 Press the Enter button.

*A decimal point will light up after the selected number on right side of the Display.

6 Turn off both Power Supplies, then turn them both on again. [Use supplied stickers to number the Hubs.]

Layout plans, wiring and Automatic Operation sequences [Refer to page 18, top]

The diagrams of each layout are reference diagrams of the location of each sensor and the insertion orientation of each DC Feeder.

The length of a train is assumed to be about a 3-car train formation. If need be, increase each block length and the gap/sensor distances within it to suit longer train lengths.

*Each layout diagram is a general example.

*A G70 insulated straight track piece can also be used to gap both rails [instead of 2 insulated rail joiners].

*The gap requirement numbers are based on gaps being placed at the branching end of Points.

*Use appropriate extension cables, if needed, depending on the distance from each device to the ND Hub.

*If using a sensor-equipped straight track piece, the layout must be adjusted to reflect its length.

Using a PC Rail or Wide Rail slab rail sensor, which can be embedded in a track piece, reduces the constraints on layout assembly.

Please familiarize yourself with this product. It does not support layouts other than the ones detailed below. We [Tomix] cannot answer questions where it is used for a customer’s own layout design, and we [Tomix] also cannot answer questions about use in combination with other manufacturers’ products, so please understand.

Legend for Layout Plan diagrams and automatic Operation Sequence diagrams [Refer to page 18, middle]

Layout Plan diagram (including cabling and block sections)

[Example] S1-3:

S: S (Sensor), F (Feeder to track) or P (Point)

1: Number of the ND Hub [1 up to 4]

3: Number of the corresponding ND Hub cable receptacle [1-8 for Sensors, 1-4 for Feeders, 1-4 for Points]

[left column in left side of box, manual pg. 18 middle]

[right column in left side of box, manual pg. 18 middle]

Various Sensor Wiring

Track Block Section Number

Track Feeder Wiring

Gap Locations

Point Wiring

*1 When inserting Feeder, follow direction of arrow.

Communication Cable

*2 Train should be placed in Block 1 for all test runs.

Various Shading of Track Blocks

Initial Positions for Trains

[right side of box, manual page 18 middle]

Automatic Operation sequence diagram

Automatic Operation sequence number

[Summary: Each row is a train, whose Block travel sequence reads from left to right. A vertical bar with arrow indicates starting in that Block number from a stop. An arrow going into a vertical bar indicates stopping in that Block number. Blocks positioned in vertical alignment indicate concurrent train operation. Travel sequences grouped in dotted boxes are repeated until paused or stopped.]

Detailed Layout Plan diagrams and Automatic Operation sequence tables

Note: Refer to pages 18-34.

[My general comments on the detailed Layout Plan diagrams (1 through 10):

1. The Layout Plan numbers are about in the middle of the heading for each diagram.
2. Some Layout Plans (like 2 and 3) have multiple diagrams, showing “Developments” of the general plan.
3. The detailed diagrams show the general arrangement of each layout, but not the actual track pieces.
4. The diagrams show the detailed placement of sensors and gaps. [insert sensors from either side of track.]
5. Track power DC Feeder orientations must be followed, but they can be located anywhere within their Block.
6. Cabling is shown in detail and must be followed precisely. Don’t get overwhelmed, just do 1 cable at a time.
7. Numbered starting locations for all trains are shown. The trains are identified by these location numbers.
8. You must run the exact number of trains indicated in the Automatic Operation sequence that you select.
9. The Test Operation sequence for testing a layout is shown in its own small box.
10. The small table shows the needed number of ND Hubs, DC Track Feeders, Sensors, and insulated rail joiners.
11. The smaller track diagram shows the numbering of Blocks and suggested station locations (shaded).
12. Check the errata correction sheet, if one came with your 5701 set, and TNOS Updates to ascertain if Tomix has subsequently corrected the detailed layout diagram. Take heart in the fact that even they get confused!
13. The errata correction sheet I received shows circled errors and a following corrected diagram for the Basic Connection Guide fold-out Layout Plan 1 (Panel 3 and 4), as well as 5701 Manual Layout Plans 1 (manual page 18), 3EX-1 (manual page 22) and 5 (manual page 25), and also Figure 33 (manual page 35).
14. You can change the physical shape of the track, as long as you leave the general “topological essence” of the diagram intact: the sequence and relative positions of the blocks, which block numbers come from the curved branches of points / turnouts, which block number come from the straight branches, etc.
15. You will get the smoothest operation of trains by making all distances between sensors about equal, then determine gap locations from that. Adjusting individual train operating Parameter Set parameters to “speed match” the trains will also help improve the smoothness of layout operation (see page 11 above).]

[My general comments on the Automatic Operation Plan diagram tables:

1. Run the Test Operation sequence first, to test out your assembly accuracy, cabling, and components. The test sequences are designed to reduce variables to a minimum, to help you with debugging.
2. Some Automatic Operation sequences, like 18 and 19 for Layout Plan 3 (at the top of manual page 24) are basically identical, but one offsets the train departure times slightly to make the operation seem more realistic than always having exactly simultaneous train departures.
3. Layout Plans 1, 4 and 5 require only one ND Hub.
4. Layout Plans 2DX, 2DX with Yard, 3EX, 3EX-1, 3EX-2, 6, 7 and 8 require two ND Hubs.
5. Layout Plan 9 requires three ND Hubs, and the cabling is so complex that Tomix shows it broken into two diagrams, with Sensor cabling shown on one and Feeder/Point cabling shown on the other.
6. Layout Plan 10 requires four ND Hubs, and is similarly broken into two cabling diagrams.
7. Layout 1 (manual page 18): oval with passing siding; one-way, two-train operation.
8. Layout 2DX (manual page 19): similar to Layout Plan 1, but with more single-track blocks and a second ND Hub to handle them; the added blocks allow smoother two-train operation than in Layout Plan 1.
9. Layout 2DX with Yard (manual page 20): oval with limited two-way, three-train operation; note 2 sensors in reversible Block 1 to handle proper stopping locations in both directions of travel.
10. Layout 3EX (man. pg. 21): oval with passing siding and a second station on the single track; one-way, two- or three-train operation. An example on Youtube shows this arrangement applied to one line of a “twice-around” oval layout (see https://www.youtube.com/watch?v=aW_p-9o45KA. Disregard the fourth train in the video, which is on the other oval track and runs in the opposite direction.)
11. Layout 3EX-1 (manual page 22): oval like 3EX but with a second passing siding (eighth block) added at the second station; limited to one-way operation, with two or three trains.
12. Layout 3EX-2 (manual page 23): oval with two passing sidings like 3EX-2, but adds another sensor to six of the eight blocks to facilitate two-way operation as well as one-way; two-train and limited four-train operation.

13. Layout 4 (manual page 24): oval with passing siding plus two-track yard. Similar in general appearance to 2DX with Yard, but simplified for a single ND Hub. The yard tracks act as extensions of Block 3 using the “full selection” power-routing feature of Tomix points / turnouts. The passing tracks run in opposite one-way directions. Two- or three-train operation. Simulates trains running to/from a storage yard from/to a station.
14. Layout 5 (manual page 25): point-to-point operation with center passing siding; each bidirectional single track end block requires three sensors; two-train operation.
15. Layout 6 (manual page 26): oval with two passing sidings; two-way operation; passing blocks are one-way pairs; two-train operation.
16. Layout 7 (manual page 27): point-to-point with two-track end terminals; center passing blocks are a one-way pair; two-train operation.
17. Layout 8 (manual page 28): 8-block oval with “parade” operation of two to seven trains (more than four trains will introduce an increasing amount of stopping; with seven only one train can move at any time.)
18. Layout 9 (manual page 30): two-track point-to-point with twin center passing sidings; four-train operation.
19. Layout 10 (manual pgs. 31-32): similar to Layout Plan 9, but with more blocks; four- and six-train operation.]

Layout Plan Partial Details

Use of LED Type 2 Bumper Track [Refer to page 35, top left and Figure 33]

We recommend using Bumper Track 1423 (LED Type 2) in a point-to-point plan. By inserting the DC Feeder in the side of the bumper track, it is possible to feed power to the rail and cut off the power if overrun.

*The example is shown incorporated in Layout Plan 5. Other plans are basically the same.

Adding a “Safety” Siding [Refer to page 35, top right and Figure 34]

You can add a [Japanese prototype] “safety” siding if you like, to a Layout Plan. To do this, use additional electric points and cable them to the ND Hub. The Layout Plans that can have safety sidings are 5, 6 and 7. [Their Automatic Operation sequences are apparently already programmed to manage these additional points.] The wiring of points differs depending on each layout plan. Refer to the separate figures shown for Layout Plans 5, 6 and 7, respectively. Add track pieces of S140 or longer between the point and the sensor.

Relationship of Direction of Travel and Orientation of DC Feeders [Refer to page 35, bottom and Figure 35]

Using Layout Plan 1 as an example, the direction of travel of the trains can be reversed by changing the insertion orientation of all of the DC Feeders.

[Note that Block 2 remains the passing siding, because it uses the curved branches of the points, regardless of being on the inside or the outside of the oval.]

[Note of possible error: I believe that in the diagrams on the right side of Figure 35, Feeders F1-3 and F1-4 should be swapped. A train leaving one of the passing tracks expects to go next to F1-3, not F1-4 as shown. It appears that the Block numbers have been swapped in these diagrams, but not the Feeder cable numbers.]

Overload Breaker Activation [Refer to page 36, top]

If the current consumption exceeds the rated output current, the overload protection function shuts off the power and the Power Indicator changes from green to red. In this case, turn the Power Switch off and end operation. The cause may be a derailment of a train, an electrical short due to metal objects on the track, a case where a device exceeding the ratings is connected, and so on. After removing the cause, move each train to its initial position shown on the appropriate Layout Plan diagram, then turn on each Power Switch [Power Indicator should light green] and confirm that normal operation resumes.

Attention: Please be careful not to put metal objects on the track that may cause an extremely dangerous short circuit.

Automatic Shut-off Feature [Refer to page 36, top/middle]

This product is equipped with an automatic shut-off feature (stops power supply) to protect trains and the product itself from load due to long-term operation. When activated, the Display will indicate “StoP”. This feature is activated under the following conditions:

Condition: When a sensor detection or an operation other than the Control Unit does not occur for 3 minutes.

*In case of sensor detection, train derailment, dirt on the sensor, wiring may be missing. Please check the condition of the train, the connection to the wiring and track, and refer to the figures for cleaning the sensors.

Maintenance of the Model Railroad [Refer to page 36, middle]

With this product, the Control Unit determines the positional relationships of the trains by the detection at the sensors and operates the trains. As a result, if a sensor, rail or train wheel is sticky or dirty, operation may not be reliable. Regularly perform various types of maintenance, referring to each explanation below. For further troubleshooting, refer to manual page 37.

Removing Dirt from the Track

If a train is not operating smoothly, the track may be dirty. Frequently clean all track with a Tomix Rail Cleaner (sold separately) in order to maintain good electrical contact. Tomix Rail Cleaner is a cleaning solution designed for models. Place a small amount of Rail Cleaner on a cloth. Allow to dry afterward.

Removing Dirt from Wheels

Consider that the wheels may be dirty when train operation is not smooth. As with track, place a small amount of Rail Cleaner on a cloth and remove the dirt by wiping the wheels.

Tomix model railroad products include a line-up of multi-wheel cleaning cars that can easily remove the dirt from the wheels, and a multi-rail cleaning car that can clean dirty rail and vacuum up dust. Please Use all means. For details, please see the Tomix Catalogue, sold separately.

Removing Dirt from Sensors

As with the track, clean sensors frequently. Using a cotton swab or cloth, brush the metal contact part of the sensor with Tomix Rail Cleaner. After cleaning, check whether any dust or dirt remains on the sensor.

Troubleshooting [Refer to pages 36, bottom and 37, top]

In case of trouble, check the following list before seeking repair services [a table of very basic issues].

Error Codes [Refer to page 37, bottom]

If an error occurs, it will be displayed as follows. When an error code is displayed, [note the code number and] turn the Control Unit power off and then on again. Other error codes may appear. In that case, please contact Tomytec Customer Service Tomix representative.

Table of Error Codes

<u>Number</u>	<u>Meaning</u>
11	SD Memory Card is not inserted.
21	SD Memory Card security code cannot be read (CID).
24	The data read from the SD Memory Card is abnormal.
30	File system start-up information cannot be read (MBR).
31	Basic information of the file system cannot be read (BPB).
40	Layout Plan settings cannot be set properly.
51	Automatic Operation sequene setting is not correct.
70	Layout is not set correctly.
71	The Automatic Operation program is not set correctly.
72	An error occurred while preparing for Automatic Operation and it is not possible to run.

[Note: Additional Error Codes have been added in TNOS Updates; refer to my notes for the various updates.]

Disclaimer

I prepared these notes and comments as a TNOS set purchaser who does not read nor understand the Japanese language. A computer translation app was used to do basic translation, followed by further analysis and hands-on experimentation. I offer this information as a timesaver for others, since I already had to do the work for myself. I make no promises or claims as to the factual accuracy and completeness of these notes and comments, and anyone who uses them accepts and bears full responsibility and liability for any consequences or damage. These notes and comments were not prepared by Tomytec or Tomix. They are not a product of Tomytec or Tomix, and they are not to be construed to be a product of Tomytec or Tomix.