

NetGain Motors, Inc.

800 South State Street / Suite 4 / Lockport, IL 60441 / 630-243-9100 / 630-685-4054 (FAX)

User Manual

DANA/TM4 Mini Display



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Table of Contents

| | |
|--|-----------|
| Mini Display Capabilities | 3 |
| Mini Display Specifications | 4 |
| Mini Display Pinout | 5 |
| Mini Display Female Mating Plug..... | 5 |
| Indicator Symbols – Compact to Mini Comparison | 6 |
| Fault Indication | 8 |
| Fault Code Guide..... | 9 |
| Additional Support | 14 |
| Settings..... | 15 |
| Overview | 15 |
| Display's Speedometer Settings..... | 15 |
| Indicator Style Settings | 16 |
| Notes..... | 17 |
| | |
| <i>Figure 1 Mini Display Engineering Drawing.....</i> | <i>4</i> |
| <i>Figure 2 Mini Display Male Connector</i> | <i>5</i> |
| <i>Figure 3 Mini Display Female Connector.....</i> | <i>5</i> |
| <i>Figure 4 - Indicator Symbol Table.....</i> | <i>7</i> |
| <i>Figure 5 - Fault Level Table</i> | <i>8</i> |
| <i>Figure 6 Diagnostic Code Level Priority List</i> | <i>9</i> |
| <i>Figure 7 Diagnostic Code List</i> | <i>14</i> |
| <i>Figure 8. Configure – Traction – Global – Control Mode.....</i> | <i>15</i> |
| <i>Figure 10. Configure – System – Displays</i> | <i>16</i> |

Mini Display Capabilities

The Mini Display is an optional add-on component for any ***HyPer-Drive X1*** or ***HyPer-Drive X144*** controller/Inverter. The immediate EV capabilities of the Mini Display include:

- Display vehicle speed in MPH or KM/H. This is a calculated value determined by tire diameter and up to two gear ratios.
- Display active fault code of highest priority.
- Indicate main battery pack state of charge.
- Indicate de-rating due to Motor or Inverter over-temperature.

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Mini Display Specifications

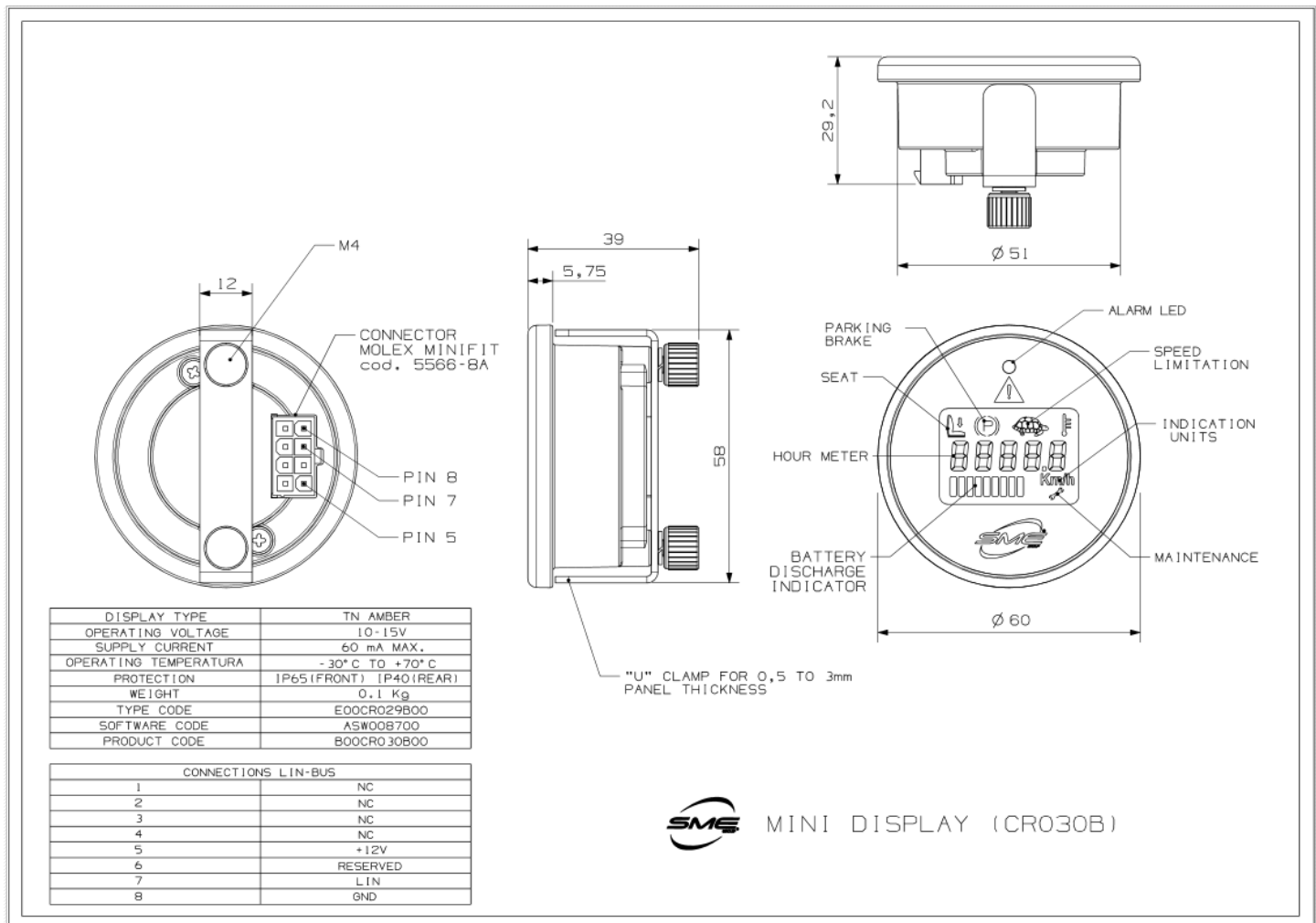


Figure 1. Mini Display Engineering Drawing

Mini Display Pinout

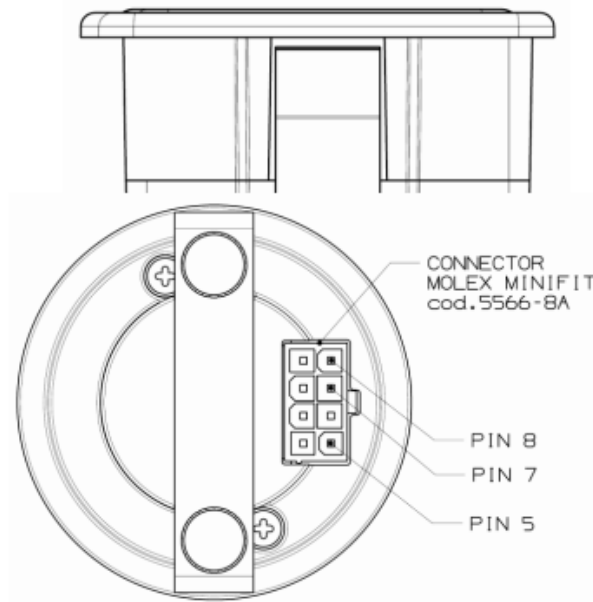


Figure 2. Mini Display Male Connector

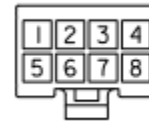
Mini Display Female Mating Plug

Included with Mini Display:

Molex Mini-Fit Jr.

Plug Part# 39-01-3085

Pin Part# 39-00-0039

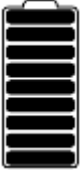









| Mini Display - 8 Position Connector | | |
|-------------------------------------|-----------------|----------|
| Pin | Name | Position |
| 8 | I/O Ground | K1-12 |
| 7 | LIN-BUS | K1-15 |
| 6 | Not Connected | N/A |
| 5 | +12V Out | K1-10 |
| 4 | Digital Input 1 | TBD |
| 3 | Digital Input 2 | TBD |
| 2 | Digital Input 3 | TBD |
| 1 | Digital Input 4 | TBD |

Figure 3. Mini Display Female Connector

Indicator Symbols – Compact to Mini Comparison

The table below contains all the information which can be visualized on SME displays. Symbols can be turned on **steady** or **blinking** depending on the user request.

| Display Element | Display COMPACT | Display MINI |
|---|---|---------------|
|  | <p>The BDI bar graph shows the estimated State of Charge value.</p> <p>If the Low BDI fault is active, the border and the bars possibly present will blink.</p> | |
|  | <p>Can be illuminated if Traction Enable circuit is open.</p> | |
|  | <p>It can be illuminated depending on the park brake input logic state.</p> | |
|  | <p>It can be illuminated when the service time is expired.</p> | |
|  | <p>It can be illuminated in case of:</p> <ul style="list-style-type: none"> • Motor or Controller High Temperature active faults. • Motor or Controller Over Temperature active faults. | |
|  | <p>It can be illuminated:</p> <ul style="list-style-type: none"> • depending on the Operating Profile active. • if traction speed limit by display is active. • if traction speed is limited by digital input/s set in speed limit menu. | |
|  | Each symbol char can be activated depending on the selected Operating Profile. | Not Available |
|  | <p>This symbol shows the steering angle (linked to Analog Speed Limit #1 Input if not DUAL TRACTION function is selected).</p> <p>it is possible to reverse the angle indication.</p> | Not Available |

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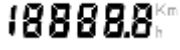
| | | |
|---|---|--|
|  | <p>It is shows the Throttle Request.</p> | <p>Not Available</p> |
|  | <p>The vehicle speed is visualized in the unit selected (mph or km/h).</p> | |
|  | <p>The value shown can change depending on the vehicle state (moving/stopped).</p> <p>The information visualized are, alternatively:</p> <ul style="list-style-type: none"> • System Time: it's the system lifetime. • System Distance: it's the total system distance. • Key on Time: it's the time since system restarts. • Trip Distance: this trip value can be reset whenever desired. | <p>It is visualized the vehicle speed (in the unit selected by the user) when the vehicle is moving.</p> <p>When the vehicle is stopped, the information visualized are, alternatively:</p> <ul style="list-style-type: none"> • System Time: it's the system lifetime. • System Distance: it's the total system distance. • Key on Time: it's the time since system restarts. • Trip Distance: this trip value can be reset whenever desired. |

Figure 4 - Indicator Symbol Table

Fault Indication

To assist system troubleshooting, the display can visualize the fault code and/or its level as specified below:

- If the Controller is set as **Standalone**, it will indicate **the controller's highest priority fault**.
- If the Controller is set as a **Node** in the CAN Network, it will indicate the **worst level fault of the Network**. In addition to the code and level information, the display will indicate the **ID of the faulty Node**. If any Node has a fault of the same level as an active controller fault, the display will indicate the controller's highest priority fault.

The user can freely **select which fault level to visualize on display**.


Below there is a summary table:

| Fault Level | Level Description on Display |
|-------------|------------------------------|
| Warning | "Care" |
| Limiting | "Cut" |
| Stopping | "Stop" |
| Blocking | "bloc" |

Figure 5 - Fault Level Table

When the fault expires, the display returns in its default state. If multiple faults conditions occur concurrently, only the highest priority fault is visualized on the display.

Fault Code Guide

The **HyPer-Drive X1™** may indicate Fault Codes ranging from *al no.1* to *al no.107*. If the controller is in a fault condition, the Fault Code can be retrieved through your Mini Display, CANBUS Communication, or through any version of the SmartView Software. A list of each code and its level is provided below. For further information on these codes, please refer to the Diagnose tier of SmartView's Help  section, and click on any Fault name for a troubleshooting guide.

- **Level:** anomalous working conditions are indicated by different alarm levels, classified as follows, depending on their effects on the system:






| Level | Priority | Action | Icon |
|----------|-----------------|---|---|
| Blocking | 1 (THE HIGHEST) | <ul style="list-style-type: none">• Main Contactor: Opened• Motors: Disabled• Outputs: Disabled |  |
| Stopping | 2 | <ul style="list-style-type: none">• Main Contactor: Closed• Motors: Stopped• Outputs: Enabled |  |
| Limiting | 3 | <ul style="list-style-type: none">• Main Contactor: Closed• Motors: Limited• Outputs: Enabled |  |
| Warning | 4 (THE LOWEST) | <ul style="list-style-type: none">• Main Contactor: Closed• Motors: Enabled• Outputs: Enabled |  |
| Ready | No Faults | <ul style="list-style-type: none">• Main Contactor: Closed• Motors: Enabled• Outputs: Enabled |  |

Figure 6. Fault Code Level Priority List

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| Code | Fault | Set Condition | Level |
|------|--|--|----------|
| 1 | <u>Over Voltage</u> | Key-switch voltage or capacitors voltage is above the maximum level allowed for the controller. | Blocking |
| 2 | <u>Under Voltage</u> | Key-switch voltage or capacitors voltage is below the minimum level allowed for the Controller. | Blocking |
| 3 | <u>User Over Voltage</u> | Key-switch voltage is above the maximum level defined by the user via related parameter. | Blocking |
| 4 | <u>User Under Voltage</u> | Key-switch voltage is below the minimum level defined by the user via related parameter. | Blocking |
| 5 | <u>Inverter 1 Over Current</u> | Inverter 1 phase current exceeded its current limit. | Blocking |
| 6 | <u>Inverter 2 Over Current</u> | Inverter 2 phase current exceeded its current limit. | Blocking |
| 7 | <u>Not Assigned</u> | - | - |
| 8 | <u>Inverter 1 Over Temperature</u> | Inverter 1 power module temperature is above +100°C. | Blocking |
| 9 | <u>Inverter 2 Over Temperature</u> | Inverter 2 power module temperature is above +100°C. | Blocking |
| 10 | <u>Inverter 1 High Temperature</u> | Inverter 1 power module temperature is above +80°C. | Limiting |
| 11 | <u>Inverter 2 High Temperature</u> | Inverter 2 power module temperature is above +80°C. | Limiting |
| 12 | <u>Inverter 1 Under Temperature</u> | Inverter 1 power module temperature is below -40°C. | Blocking |
| 13 | <u>Inverter 2 Under Temperature</u> | Inverter 2 power module temperature is below -40°C. | Blocking |
| 14 | <u>Inverter 1 Current Sensor Fault</u> | Current sensor of Inverter 1 measures an invalid offset at key on. | Blocking |
| 15 | <u>Inverter 2 Current Sensor Fault</u> | Current sensor of Inverter 2 measures an invalid offset at key on. | Blocking |
| 16 | <u>Not Assigned</u> | - | - |
| 17 | <u>Inverter 1 Temp Sensor Fault</u> | Difference between Inverter 1 and microprocessor temperature greater than 70°C. | Stopping |
| 18 | <u>Inverter 2 Temp Sensor Fault</u> | Difference between Inverter 2 and microprocessor temperature greater than 70°C. | Stopping |
| 19 | <u>Motor 1 Over Temperature</u> | Motor 1 temperature is above the Motor 1 Over Temperature defined by the user via related parameter. | Stopping |
| 20 | <u>Motor 2 Over Temperature</u> | Motor 2 temperature is above the Motor 2 Over Temperature defined by the user via related parameter. | Stopping |

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| | | | |
|----|--|--|----------|
| 21 | <u>Motor 1 High Temperature</u> | Motor 1 temperature is above the motor Start Cutback Temperature defined by the user via related parameter. | Limiting |
| 22 | <u>Motor 2 High Temperature</u> | Motor 2 temperature is above the motor Start Cutback Temperature defined by the user via related parameter. | Limiting |
| 23 | <u>Motor 1 Temp Sensor Fault</u> | Motor 1 temperature sensor value is out of permitted range. | Limiting |
| 24 | <u>Motor 2 Temp Sensor Fault</u> | Motor 2 temperature sensor value is out of permitted range. | Limiting |
| 25 | <u>High Voltage</u> | Key-switch Voltage or Capacitors Voltage is above the Controller Starting Cutback Voltage defined by the user via related parameter. | Limiting |
| 26 | <u>Low Voltage</u> | Key-switch Voltage or Capacitors Voltage is below the Controller Starting Cutback Voltage defined by the user via related parameter. | Limiting |
| 27 | <u>Microprocessor Over Temperature</u> | Microprocessor temperature is above 125°C. | Blocking |
| 28 | <u>+5V Supply Failure</u> | +5V supply is outside the +5V \pm 10% range. | Blocking |
| 29 | <u>+12V Supply Failure</u> | +12V supply is outside the +12V \pm 10% range. | Blocking |
| 30 | <u>Encoder 1 Fault</u> | Sin/Cos inputs values are above/below the fault thresholds or spin sensor offset is not right. | Blocking |
| 31 | <u>Encoder 2 Fault</u> | Sin/Cos inputs values are above/below the fault thresholds. | Blocking |
| 32 | <u>Driver Output 1 Open/Short</u> | Driver Output 1 is either opened or short-circuited. | Blocking |
| 33 | <u>Driver Output 2 Open/Short</u> | Driver Output 2 is either opened or short-circuited. | Blocking |
| 34 | <u>Driver Output 3 Open/Short</u> | Driver Output 3 is either opened or short-circuited. | Blocking |
| 35 | <u>Digital Output 1 Open/Short</u> | Digital Output 1 is either opened or short-circuited. | Blocking |
| 36 | <u>Digital Output 2 Open/Short</u> | Digital Output 2 is either opened or short-circuited. | Blocking |
| 37 | <u>EEPROM Failure</u> | Error during read/write operation in EEPROM memory. | Blocking |
| 38 | <u>EEPROM Corrupted</u> | Memory CRC doesn't match. | Blocking |
| 39 | <u>Driver Output 4 Open/Short</u> | Driver Output 4 is either opened or short-circuited. | Blocking |
| 40 | <u>PreCharge Circuit Fault</u> | Pre-charge of internal line capacitors is too fast or capacitors voltage is fixed to zero during precharge. | Blocking |

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| | | | |
|----|---|---|----------|
| 41 | <u>PreCharge Failed</u> | Pre-charge phase fails to charge capacitors till the voltage level of key input. | Blocking |
| 42 | <u>Main Contactor Welded</u> | Before closing the line contactor, internal capacitors are loaded for short time and voltage doesn't go down. | Blocking |
| 43 | <u>Main Contactor Did Not Close</u> | The difference between key switch and capacitors voltage is too high after the contactor has been powered. | Blocking |
| 44 | <u>Interlock Disabled</u> | Interlock input is not active and line contactor is open. | Stopping |
| 45 | <u>Static Return to Off Traction</u> | One or more traction inputs are active at the key on, after an Emergency stop or a controlled stop procedure. | Warning |
| 46 | <u>Static Return to Off Hydraulic</u> | One or more hydraulic/pump inputs are active at the key on after a controlled stop procedure. | Warning |
| 47 | <u>Traction Throttle Fault</u> | A fault condition of traction throttle is detected. | Stopping |
| 48 | <u>Hydraulic Throttle Fault</u> | A fault condition of hydraulic/pump throttle is detected. | Stopping |
| 49 | <u>Brake Throttle Fault</u> | A fault condition of brake throttle is detected. | Stopping |
| 50 | <u>Service Time Expired</u> | Service Timer has expired. | Warning |
| 51 | <u>Low Battery State of Charge</u> | Battery state of charge estimated is lower than minimum value defined by the user via related parameter. | Limiting |
| 52 | <u>Wrong Parameter</u> | Parameter setting is out of the permitted range. | Blocking |
| 53 | <u>Restart Required</u> | Changed a parameter setting. | Blocking |
| 54 | <u>Can Bus Off</u> | Bus Off condition detected. | Stopping |
| 55 | <u>Can Open Circuit</u> | Messages no longer received. | Stopping |
| 56 | <u>Can Bad Wiring or Short Circuit</u> | Can bus synchronization phase failed or bus off condition detected. | Blocking |
| 57 | <u>Not Assigned</u> | - | - |
| 58 | <u>Not Assigned</u> | - | - |
| 59 | <u>Not Assigned</u> | - | - |
| 60 | <u>Not Assigned</u> | - | - |
| 61 | <u>Not Assigned</u> | - | - |
| 62 | <u>Net Timeout Heartbeat</u> | At least one Heartbeat hasn't been received during the startup of the network or after the synchronization phase. | Stopping |
| 63 | <u>Net RPDO Timeout</u> | At least one PDO hasn't been received. | Stopping |
| 64 | <u>Main Contactor Close Command Timeout</u> | Pre-charge timer has expired before the master sends the power ready request. | Blocking |
| 65 | <u>Blocking Request From Master</u> | Fault Request is received from Master. | Blocking |

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| | | | |
|-----|---|--|--------------|
| 66 | <u>Not Assigned</u> | - | Not Assigned |
| 67 | <u>Net Startup Timeout</u> | The node hasn't been able to synchronize itself to the network. | Blocking |
| 68 | <u>Net External Failure</u> | At least one Node has become not operational. | Stopping |
| 69 | <u>Net Mains Manager Wrong Sequence</u> | The Main Contactor Manager has executed a wrong powering procedure. | Blocking |
| 70 | <u>Net Mains Manager Precharge Too Slow</u> | DC Bus Voltage will not increase after discharging phase. | Blocking |
| 71 | <u>Net Mains Manager Closing Too Slow</u> | The main contactor doesn't close. | Blocking |
| 72 | <u>Net Mains Manager Powering Alarm</u> | At least one fault has occurred on Main Contactor Manager Controller. | Blocking |
| 73 | <u>CO Synchro Failed</u> | At least one node of the network could be wrong configured or switched off. | Blocking |
| 74 | <u>CO Synchro Lost</u> | At least one node of the network could be wrong configured or switched off during operation. | Stopping |
| 75 | <u>Stopped For System Fault</u> | Node is stopped because another node has a stopping/blocking fault condition. | Stopping |
| 76 | <u>Blocked for System Fault</u> | Node is blocked because another node has a stopping/blocking fault condition. | Blocking |
| 77 | <u>BMS Wall Charge</u> | The TAU Node sets a blocking fault. | Blocking |
| 78 | <u>BMS Stop</u> | The TAU Node sets a stopping fault | Stopping |
| 79 | <u>BMS Fault</u> | The TAU Node sets a blocking fault. | Blocking |
| 80 | <u>BMS Limiting</u> | The TAU Node limits its current to the required value from BMS. | Limiting |
| 81 | <u>Steering Sensor Fault</u> | A fault condition of steering sensor is detected. | Limiting |
| 82 | <u>CAN Protocol Run Time Error</u> | Wrong Request for Driver Outputs | Limiting |
| 83 | <u>Programming Required</u> | Controller Firmware Programming | Blocking |
| 84 | <u>DigInputs Overvoltage</u> | Digital Input Supply has reached dangerous value | Blocking |
| 85 | <u>Inverter Model Not Supported</u> | Inverter model is not supported by the firmware. | Blocking |
| 97 | <u>Commission In Progress</u> | Spin sensor commission is in progress | Warning |
| 98 | <u>Commission End Success</u> | Spin sensor commission end successfully | Stopping |
| 99 | <u>Commission End Errors</u> | Spin sensor commission end with errors | Stopping |
| 100 | <u>Internal Software Fault 1</u> | Internal Error. | Blocking |

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| | | | |
|-----|---|-----------------|----------|
| 101 | Internal Software Fault 2 | Internal Error. | Warning |
| 102 | Internal Software Fault 3 | Internal Error. | Warning |
| 103 | Internal Hardware Fault 1 | Internal Error. | Blocking |
| 104 | Internal Hardware Fault 2 | Internal Error. | Blocking |
| 105 | Internal Hardware Fault 3 | Internal Error. | Blocking |
| 106 | Internal Hardware Fault 4 | Internal Error. | Blocking |
| 107 | Internal Software Fault 4 | Internal Error. | Blocking |

Figure 7. Fault Code List

Additional Support

If you need additional support to solve Fault Codes signaled by the firmware or strange behaviors of the vehicle, please contact your Authorized Dealer.

In order to make the collection of information faster, you must provide them:

1. **Product Code** of the Controller.
2. Clone file of the Controller.
3. Screenshots of the **About** Page in the Main Menu.
4. Screenshots of the **Active Faults** Tab in DIAGNOSE
5. Screenshots of the **Faults History** Tab in DIAGNOSE
6. Screenshots of the **Time/Distance** Tab in MONITOR

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Settings

Overview

Setting modifications for the Mini Display are handled in SmartView OEM version that is supplied to all Authorized Dealers. If you need to modify any of the following parameters, please send your controller's current Clone File to your Dealer, along with the list of requested value/setting changes. Below is a list of possible Mini Display settings.

Display's Speedometer Settings

Vehicle Mph or Km/h is represented on the Mini Display. Vehicle Speed is calculated using the Tire Diameter and up to two Gear Ratios. A Digital Input can be assigned and wired to the 2nd Gear sensor for Second Gear speed calculation.

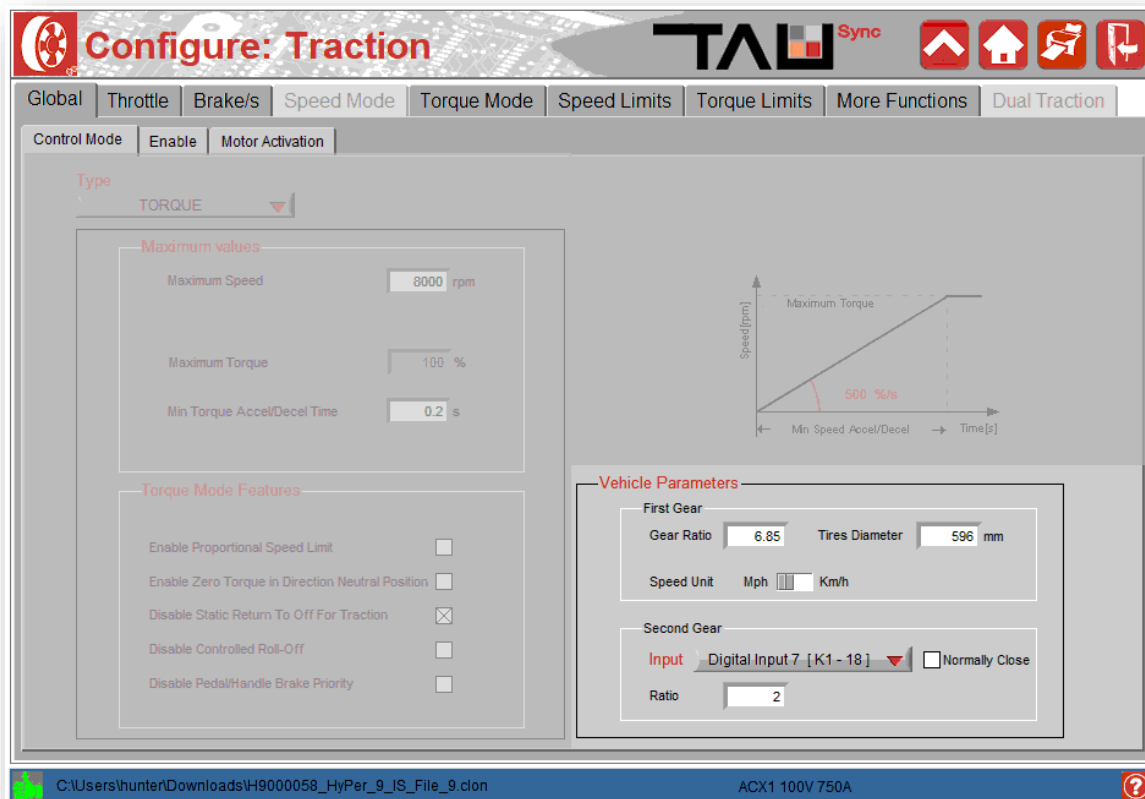


Figure 8. *Configure – Traction – Global – Control Mode*

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Indicator Style Settings

The Mini Display provides a list of system condition indicators. The style of these indicators can be set can be modified on the SmartView OEM *Display* tab.

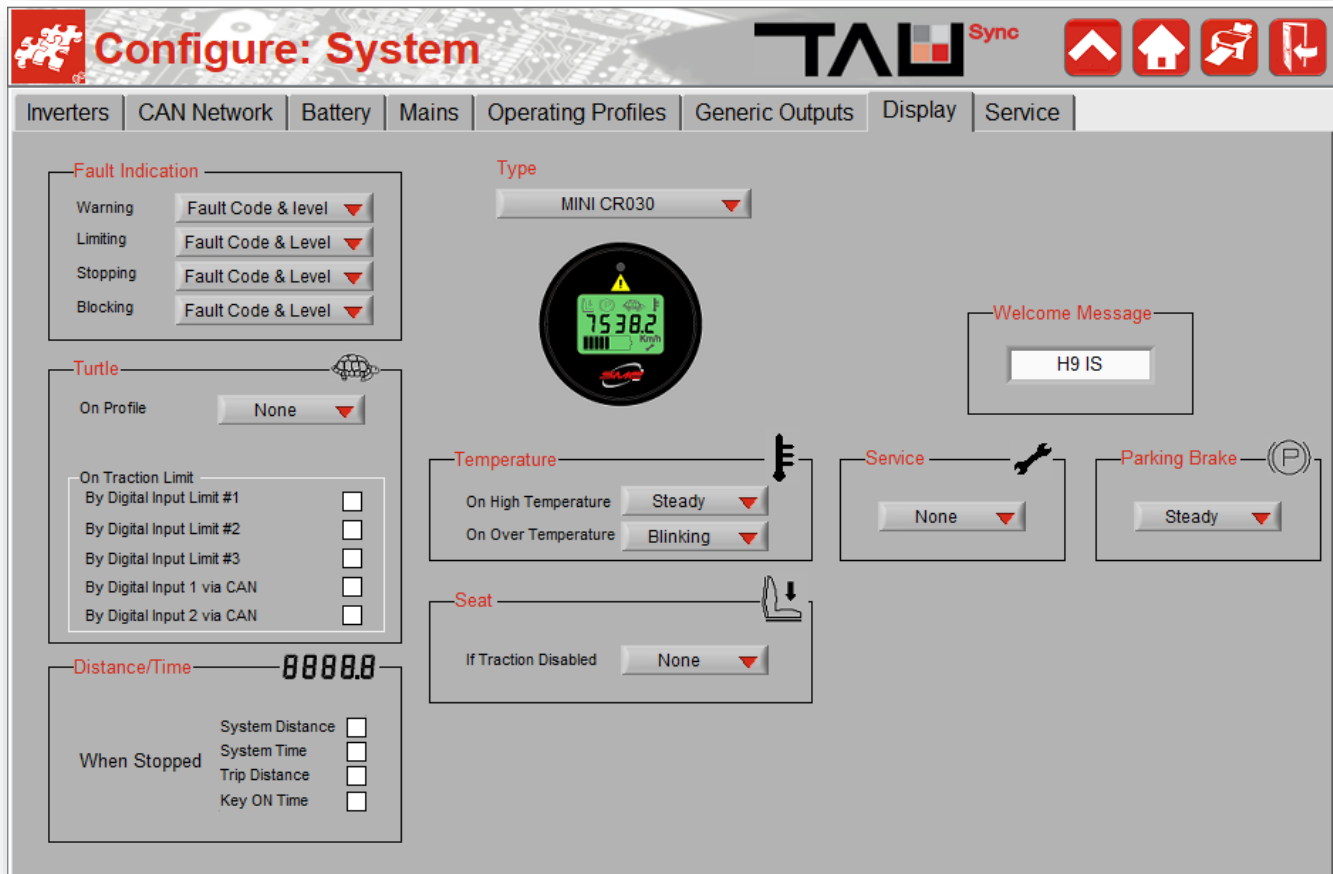


Figure 10. *Configure – System – Displays*

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This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.