

## Si18HyUdMTC1-50V-20A, Application Notes and Drawings

The [Si18HyUdMTC1-50V](#) Hybrid Controller Board can be used in numerous applications and in several control-modes. Some of these applications are described in the application notes listed below.

- [Si18HC -BDSH-NTCL12V-AppNote](#)
- [Si18HC -HCSH-TEcCL12V-AppNote](#)
- [Si18HC -HCTEHP-TEc12V-AppNote](#)
- [Si18HC-HSH-RHCL12V-AppNote](#)
- [Si18HC -SH-NTCL12V-AppNote](#)
- [Si18HC -SH-NTOL12V-AppNote](#)
- [Si18HC -SHWB-RHCL24V-AppNote](#)
- [Si18HC -WBMS-RHOL12V-AppNote](#)



These applications are used with one or more accessories depending on the required control mode.

All hybrid applications use the following accessories: [Si18Pot2PB2MC8](#) (two potentiometers and two push buttons with 12" long cable, and one 8-pin connector) and the [Si24LCD2L20CH](#) (a 2-Line by 20-character long LCD with back light, 8" long 14-strand ribbon-cable with two 14-pin connectors). Other accessories are also required.

To achieve closed-loop motor speed control mode (RPM control only), choose the following accessories:

- [Si18RPMsens](#)
- [Si18RPMwheel](#)

To achieve closed-loop proportional temperature control mode (temperature only), choose the following accessories:

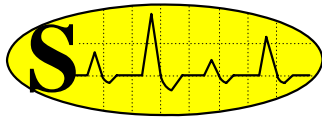
- [Si18DTsens](#)
- [Si18LEDhc](#)

To achieve simultaneously closed-loop motor speed control and closed-loop proportional temperature control mode, choose the following accessories:

- [Si18RPMsens](#)
- [Si18RPMwheel](#)
- [Si18DTsens](#)
- [Si18LEDhc](#)

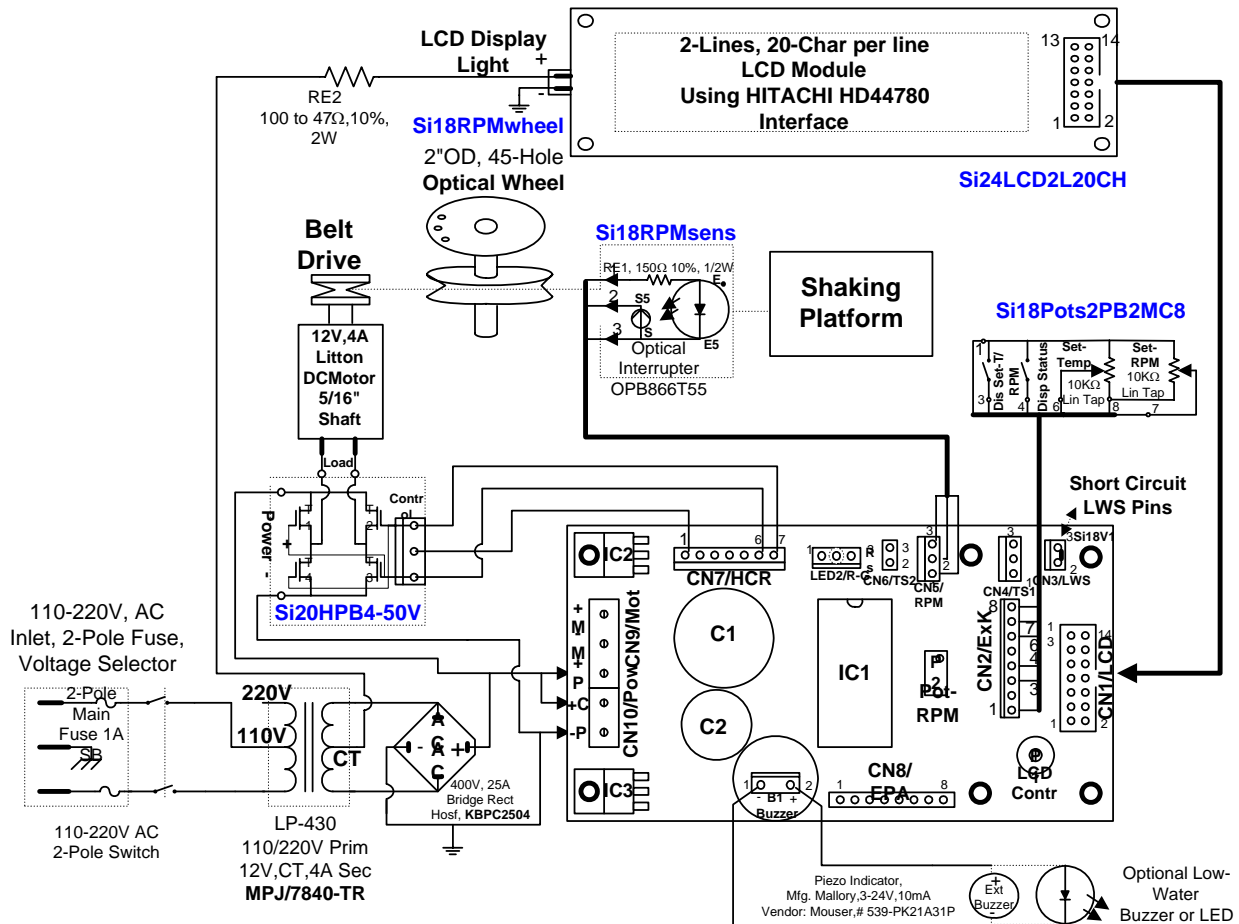
To achieve simultaneously open-loop motor speed control and closed-loop proportional temperature control mode, choose the following accessories:

- [Si18DTsens](#)
- [Si18LEDhc](#)

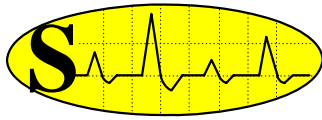


## Si18HC-BDSh-NTCL12V Application Note

In this application, the [Si18HyUdMTC1-50V](#) hybrid-controller board is operating in the Bi-directional RPM control-only mode, functioning as a bi-directional shaker (**BDSh**). No temperature control is allowed, but closed-loop speed control is performed on a 12 V, 4 A, DC motor (**NTCL 12V**). The bi-directional motor rotation is achieved using the Model [Si20HPB4-50V](#) (High Power H-Bridge Board). The closed-loop motor speed control is accomplished by using the accessories [Si18RPMsens](#) and [Si18RPMwheel](#). The shaking platform and the wheel are firmly coupled (no slip) and maintained at a constant rotational speed by the optical feed-back. The [Si18Pot2PB2MC8](#) accessory is used for control inputs. A 2 lines by 20 characters long LCD (with HITACHI HD44780 Interface Standard) is used for set and measured RPM data display. The LCD with back-light (with 8" cable, and with two 14-pin connectors) can be ordered from Signal with part number of [Si24LCD2L20CH](#) ; OEM pricing is available from Sunlike Display Tech Corp. in Taiwan, <http://www.lcd-modules.com.tw>. The DC Motor can be purchased from Bodine, [www.bodine-electric.com](http://www.bodine-electric.com) ; or from other vendors, [http://www.e-motorsonline.com/emotors/dcmproduct\\_list.php](http://www.e-motorsonline.com/emotors/dcmproduct_list.php) .

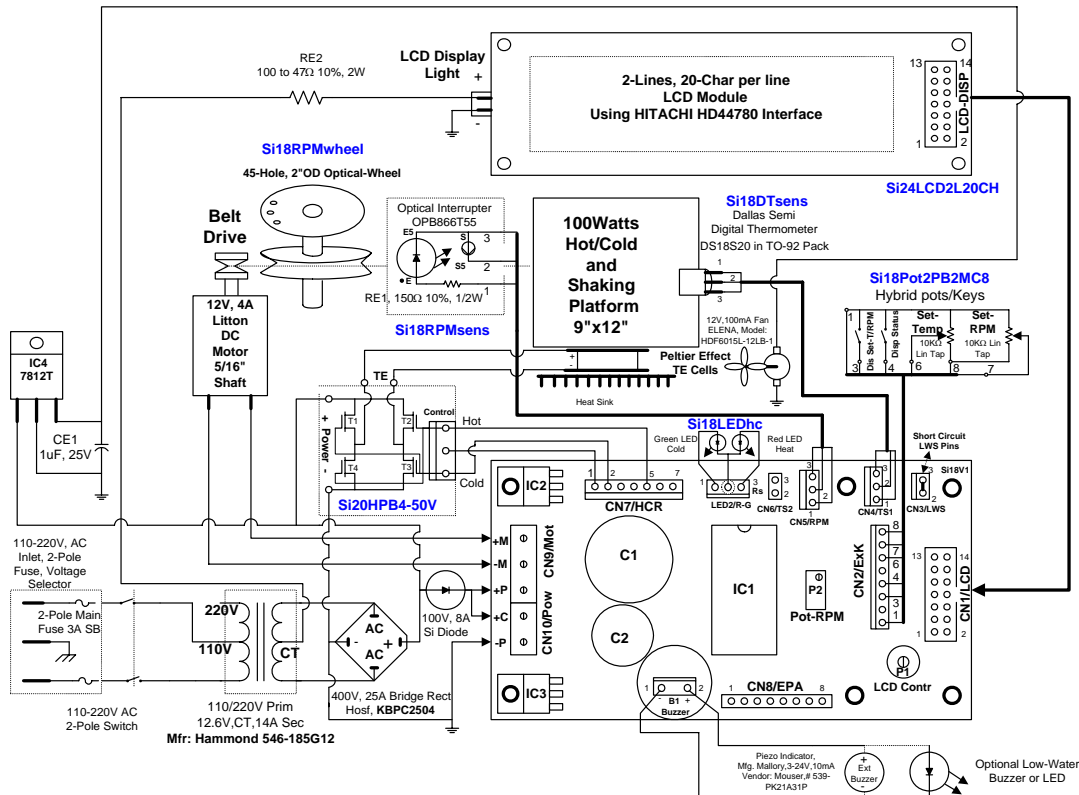


\* This circuit has been thoroughly tested by Signal Consulting, LLC; and it has worked satisfactorily in all applications. However, Signal Consulting, LLC does not assume any legal responsibility or will not be held legally liable in its use, under any circumstances.

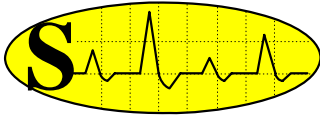


## Si18HC-HCSh-TEcCL12V Application Note

In this application, the [Si18HyUdMTC1-50V](#) hybrid-controller board is used in a simultaneous proportional temperature and RPM control mode. This equipment is functioning as a heated or cooled (with TE Cells) shaking platform (**HCSh**), having closed-loop motor-speed control. The unidirectional speed rotation is performed on a 12 V, 4 A, DC motor (**TEcCL 12V**) and the TE Cells are powered by the Model [Si20HPB4-50V](#) (High Power H-Bridge Board). The platform temperature is measured and controlled with 1/2° C accuracy in the -25°C to +102°C range. This temperature is measured with the [Si18DTsens](#) 9-bit, digital-thermometer sensor, while the [Si18LEDhc](#) accessory indicates that the heater or cooler is turned on. The closed-loop speed control is accomplished by using the accessories [Si18RPMsens](#) and [Si18RPMwheel](#). The heated/cooled shaking-platform and the wheel are firmly coupled (no slip) and maintained at a constant rotational speed by the optical feedback. The [Si18Pot2PB2MC8](#) accessory is used for control inputs. A 2 line by 20 characters long LCD (with HITACHI HD44780 Interface Standard) is used for Set-Temperature, Measured-Temperature, Set-RPM and Measured-RPM data display. The LCD with back-light (with 8" cable, and with two 14-pin connectors) can be ordered from Signal with part number of [Si24LCD2L20CH](#) ; OEM pricing is available from Sunlike Display Tech Corp. in Taiwan, [www.lcd-modules.com.tw](http://www.lcd-modules.com.tw). The TE Cells can be purchased from Melcor Corp. Trenton, NJ 08648 USA, [www.melcor.com](http://www.melcor.com) . The DC Motor can be purchased from Bodine, [www.bodine-electric.com](http://www.bodine-electric.com) ; or from other vendors, [www.e-motorsonline.com/emotors/dcmproduct\\_list.php](http://www.e-motorsonline.com/emotors/dcmproduct_list.php) .

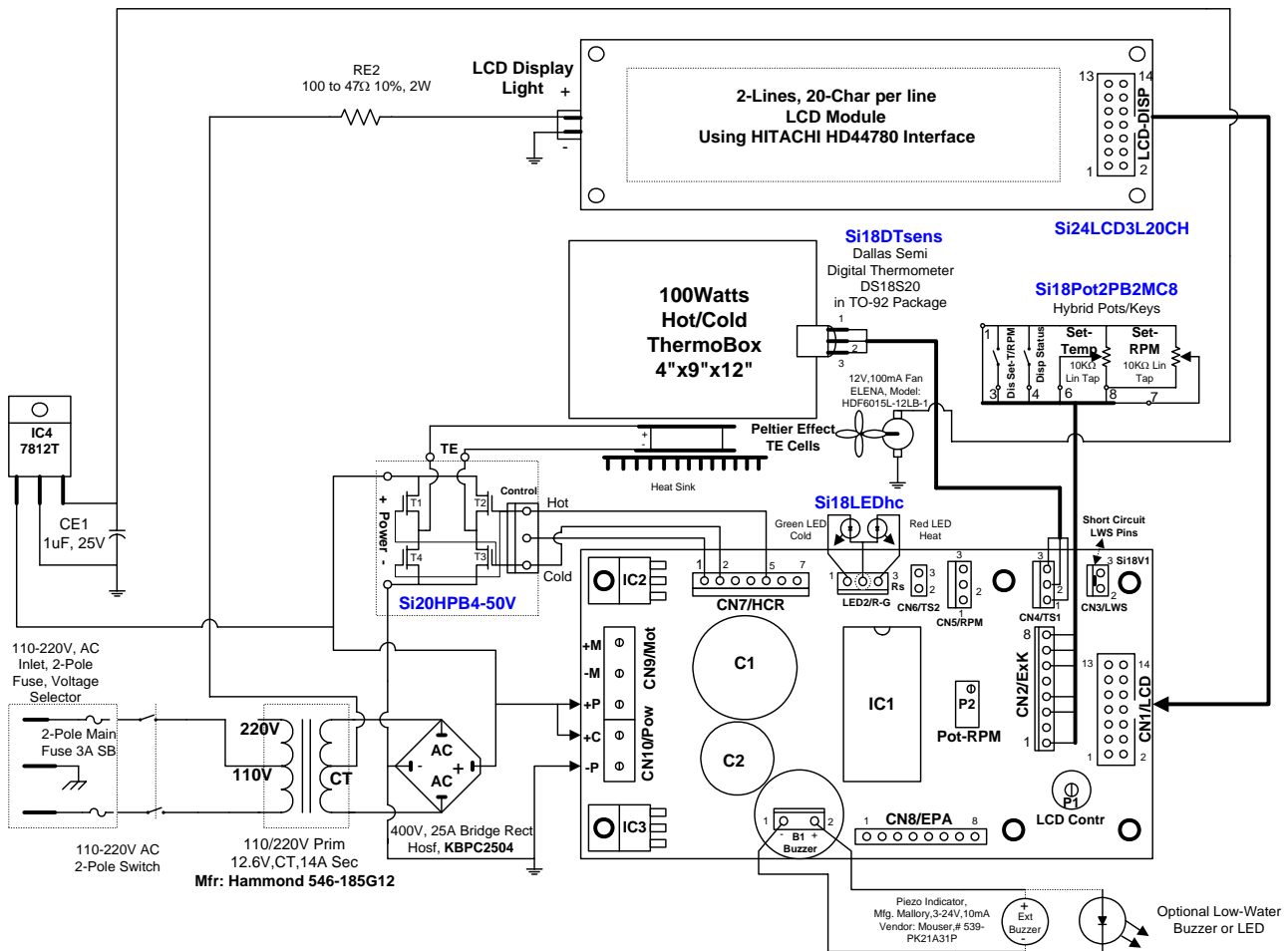


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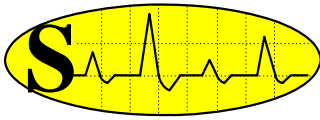


## Si18HC-HCTEHP-TEc12V Application Note

In this application, the [Si18HyUdMTC1-50V](#) hybrid-controller board is operating in the proportional temperature controller only mode (**HCTEHP**) with heating or cooling performed by the TE Cells, operating at 12 V, 12 A (**TEc 12V**). The TE Cells are powered by the [Si20HPB4-50V](#) (High Power H-Bridge Board). The platform temperature is measured and controlled with 1/2<sup>0</sup> C accuracy in the -25<sup>0</sup>C to +102<sup>0</sup>C range. This temperature is measured with the [Si18DTsens](#) 9-bit, digital-thermometer sensor, while the [Si18LEDhc](#) accessory indicates that the heater or cooler is turned on. The [Si18Pot2PB2MC8](#) accessory is used for control inputs. A 2 line by 20 characters long LCD (with HITACHI HD44780 Interface Standard) is used for Set-Temperature and Measured-Temperature data display. The LCD with back-light (with 8" cable, and with two 14-pin connectors) can be ordered from Signal with part number of [Si24LCD2L20CH](#) ; OEM pricing is available from Sunlike Display Tech Corp. in Taiwan, <http://www.lcd-modules.com.tw>. The TE Cells can be purchased from Melcor Corp. Trenton, NJ 08648 USA, [www.melcor.com](http://www.melcor.com).



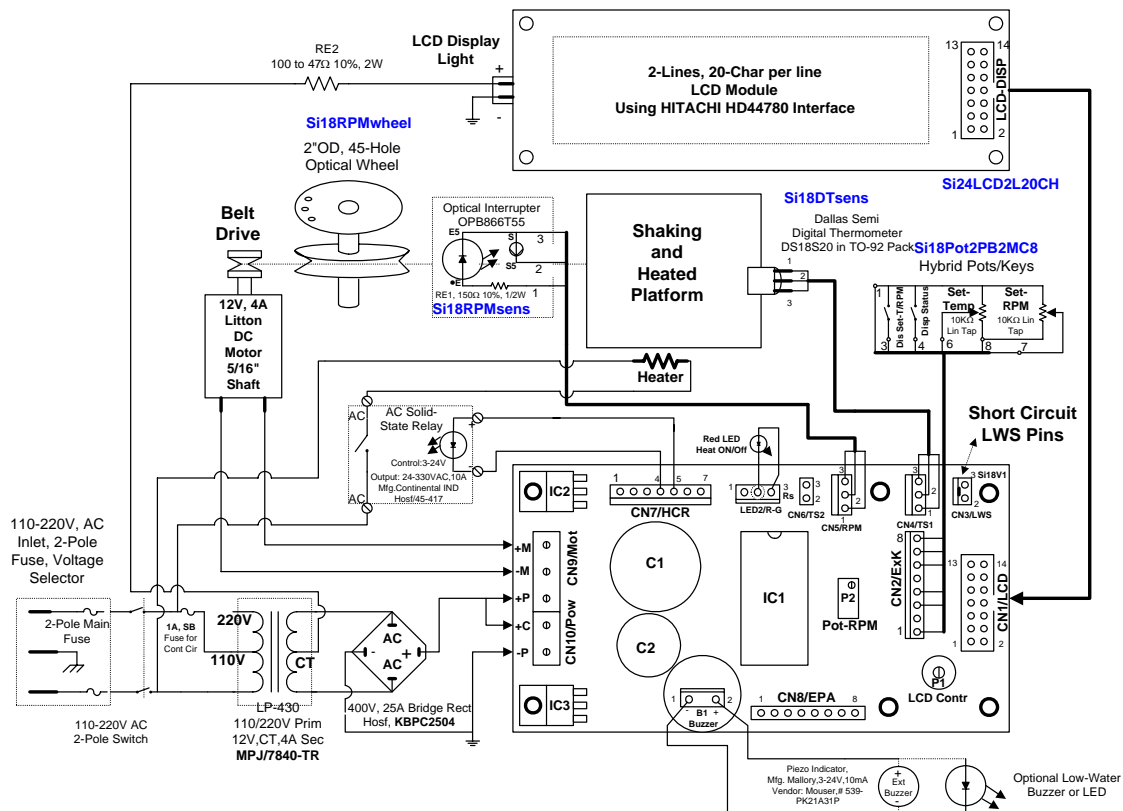
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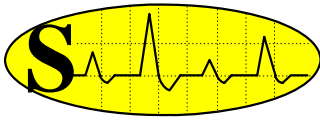
## Si18HC-HSh-RHCL12V Application Note

In this application, the [Si18HyUdMTC1-50V](#) hybrid-controller board is used in a simultaneous proportional temperature and RPM control mode. This equipment is functioning as a unidirectional heated shaker (**HSh**) with resistive heating, while closed-loop speed control is performed on the 12 V, 4 A, DC motor (**RHCL12V**). The unidirectional motor rotation is achieved by the [Si18HyUdMTC1-50V](#) board and an external Optical-Relay is used to PWM control a 117 Vrms heater. The platform temperature is measured and controlled with 1/2<sup>0</sup> C accuracy in the -25<sup>0</sup>C to +102<sup>0</sup>C range. This temperature is measured with the [Si18DTsens](#) 9-bit, digital-thermometer sensor, while the [Si18LEDhc](#) accessory indicates that the heater or cooler is turned on. The [Si18Pot2PB2MC8](#) accessory is used for control inputs and the motor speed closed-loop control is accomplished by using the accessories [Si18RPMsens](#) and [Si18RPMwheel](#). The heated/cooled shaking-platform and the wheel are firmly coupled (no slip) and maintained at a constant rotational speed by the optical feedback. A 2 line by 20 characters long LCD (with HITACHI HD44780 Interface Standard) is used for Set-Temperature, Measured-Temperature, Set-RPM and Measured-RPM data display. The LCD with back-light (with 8" cable, and with two 14-pin connectors) can be ordered from Signal with part number of [Si24LCD2L20CH](#) ; OEM pricing is available from Sunlike Display Tech Corp. in Taiwan, <http://www.lcd-modules.com.tw>.

The DC Motor can be purchased from Bodine, [www.bodine-electric.com](http://www.bodine-electric.com) ; or from other vendors, [http://www.e-motorsonline.com/emotors/dcmproduct\\_list.php](http://www.e-motorsonline.com/emotors/dcmproduct_list.php) .

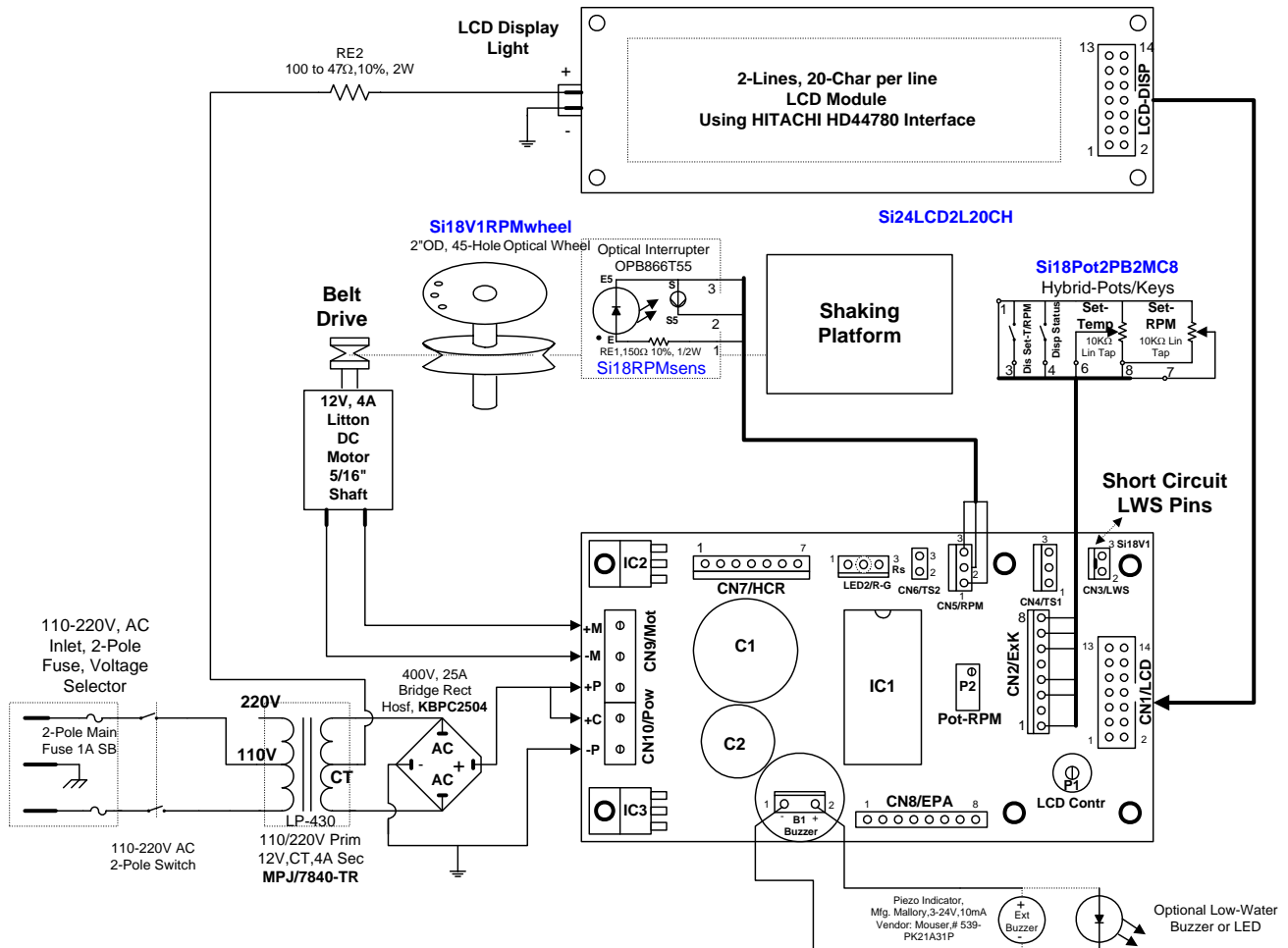


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## Si18HC-Sh-NTCL12V Application Note

In this application, the [Si18HyUdMTC1-50V](#) hybrid-controller board is operating in the unidirectional RPM control-only mode, functioning as a shaker (**Sh**). No heating or cooling allowed, but closed-loop speed control is performed on a 12 V, 4 A, DC motor (**NTCL 12V**). The unidirectional motor-speed control is achieved using the [Si18HyUdMTC1-50V](#) board and the loop is closed with the accessories [Si18RPMsens](#) and [Si18RPMwheel](#). The shaking platform and the wheel are firmly coupled (no slip) and maintained at a constant rotational speed by the optical feedback. The [Si18Pot2PB2MC8](#) accessory is used for control inputs. A 2 line by 20 characters long LCD (with HITACHI HD44780 Interface Standard) is used for Set-Speed and Measured-Speed data display. The LCD with back-light (with 8" cable, and with two 14-pin connectors) can be ordered from Signal with part number of [Si24LCD2L20CH](#); OEM pricing is available from Sunlike Display Tech Corp. in Taiwan, [www.lcd-modules.com.tw](http://www.lcd-modules.com.tw). The DC Motor can be purchased from Bodine, [www.bodine-electric.com](http://www.bodine-electric.com); or from other vendors, [http://www.e-motorsonline.com/emotors/dcmproduct\\_list.php](http://www.e-motorsonline.com/emotors/dcmproduct_list.php).

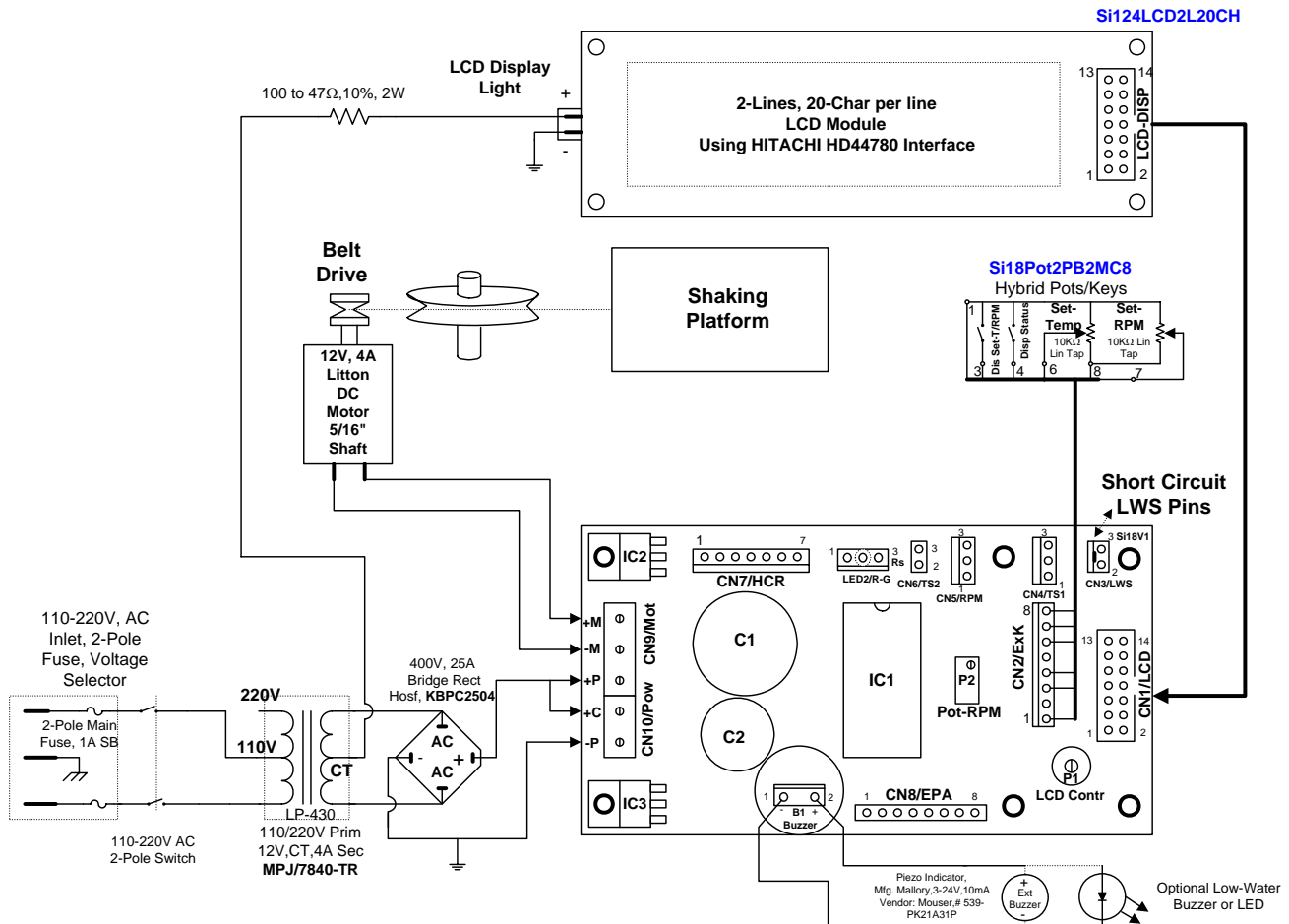


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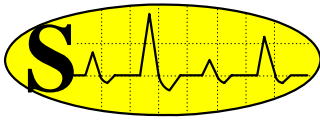


## Si18HC-Sh-NTOL12V Application Note

In this application, the [Si18HyUdMTC1-50V](#) hybrid-controller board is operating in the unidirectional RPM control-only mode, functioning as a shaker (**Sh**). No heating or cooling allowed, but open-loop speed control is performed on a 12 V, 4 A, DC motor (**NTOL 12V**). The open-loop motor speed is calibrated with the 25 turn trim-pot (**Pot-RPM**) mounted on the **Si18** board and the [Si18Pot2PB2MC8](#) accessory is used for control inputs. The shaking platform is maintained at an approximate speed value and subject to variations due to load changes. A 2 line by 20 characters long LCD (with HITACHI HD44780 Interface Standard) is used for Set-Speed and Measured-Speed data display. The LCD with back-light (with 8" cable, and with two 14-pin connectors) can be ordered from Signal with part number of [Si24LCD2L20CH](#) ; OEM pricing is available from Sunlike Display Tech Corp. in Taiwan, [www.lcd-modules.com.tw](#). The DC Motor can be purchased from Bodine, [www.bodine-electric.com](#) ; or from other vendors, [http://www.e-motorsonline.com/emotors/dcmproduct\\_list.php](http://www.e-motorsonline.com/emotors/dcmproduct_list.php) .

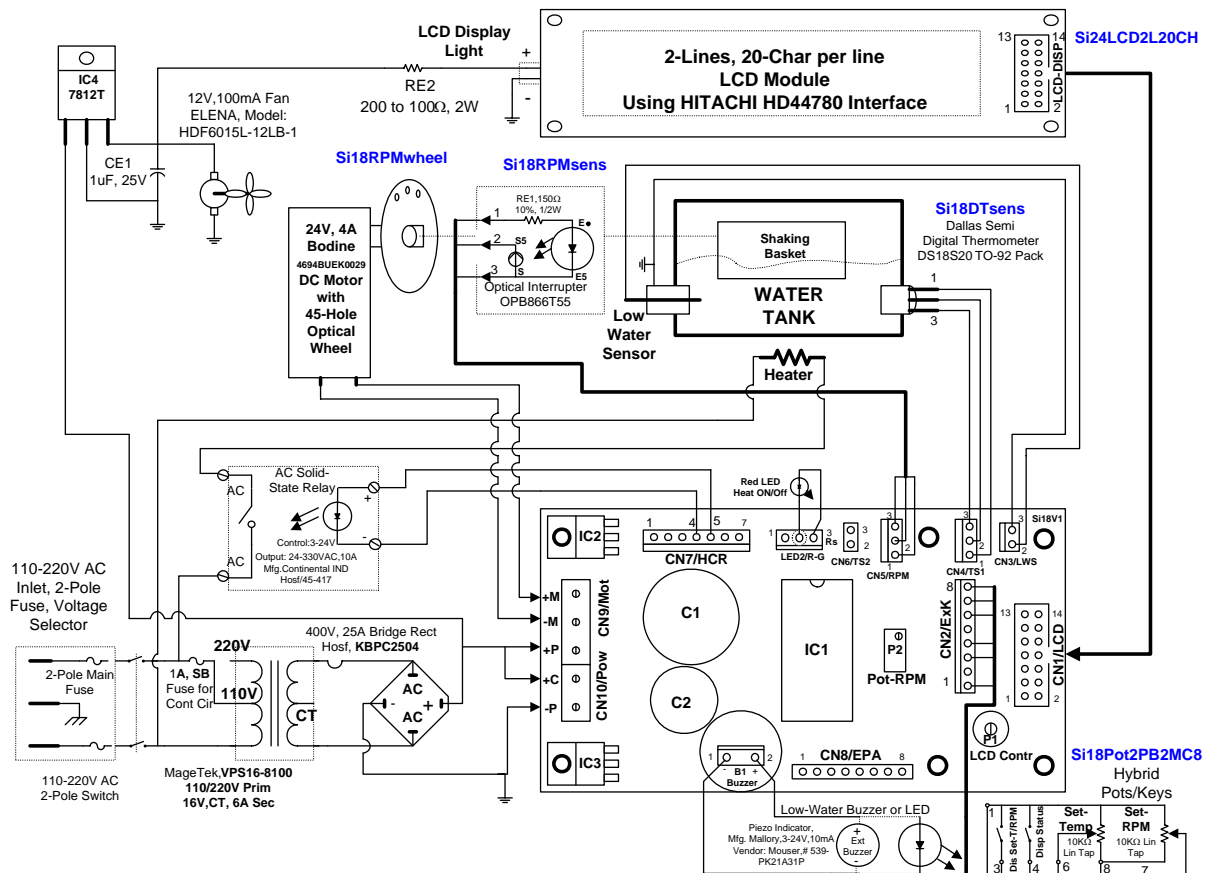


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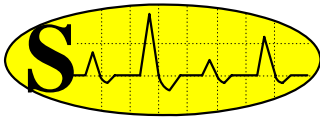


## Si18HC-ShWB-RHCL24V Application Note

In this application, the [Si18HyUdMTC1-50V](#) hybrid-controller board is used in a simultaneous proportional temperature and RPM control mode. This equipment is functioning as a Shaking and Heated Water-Bath (**ShWB**) with Resistive Heating, where closed-loop speed control is performed on a 24 V, 4 A, DC motor (**RHCL24V**). The shaking-basket is immersed in water and the basket is maintained at a constant speed by the optical feedback path, created by accessories [Si18RPMsens](#) and [Si18RPMwheel](#). An external Optical-Relay is used to PWM-control a 117 Vrms heater. The water temperature is measured and controlled with 1/2<sup>0</sup> C accuracy in the -25<sup>0</sup>C to +100<sup>0</sup>C range. This temperature is measured with the [Si18DTsens](#) 9-bit, digital-thermometer sensor, while the [Si18Pot2PB2MC8](#) accessory is used for control inputs. A 2 line by 20 characters long LCD (with HITACHI HD44780 Interface Standard) is used for Set-Temperature, Measured-Temperature, Set-RPM and Measured-RPM data display. The LCD with back-light (with 8" cable, and with two 14-pin connectors) can be ordered from Signal with part number of [Si24LCD2L20CH](#) ; OEM pricing is available from Sunlike Display Tech Corp. in Taiwan, [www.lcd-modules.com.tw](http://www.lcd-modules.com.tw). The DC Motor can be purchased from Bodine, [www.bodine-electric.com](http://www.bodine-electric.com) ; or from other vendors, [http://www.e-motorsonline.com/emotors/dcmproduct\\_list.php](http://www.e-motorsonline.com/emotors/dcmproduct_list.php) .

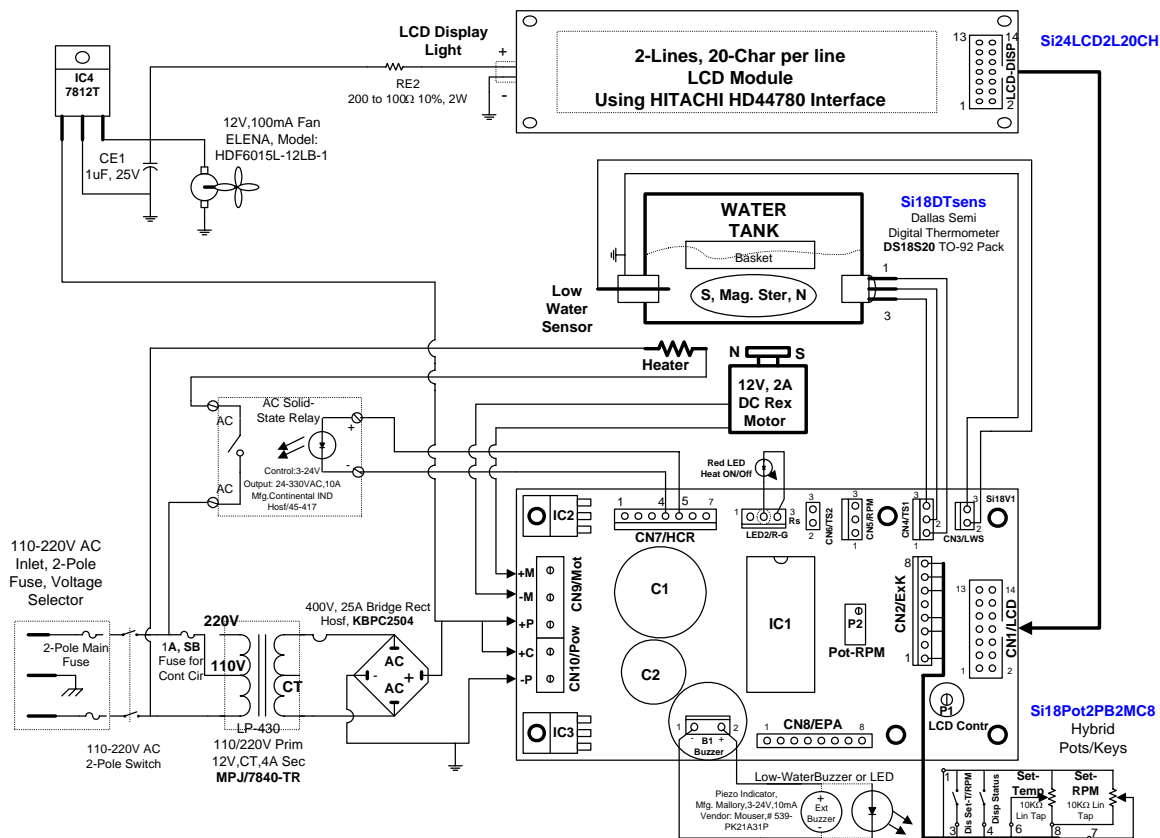


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## Si18HC-WBMS-RHOL12V Application Note

In this application, the [Si18HyUdMTC1-50V](#) hybrid-controller board is used in a simultaneous proportional temperature and RPM control mode. This equipment is functioning as a Heated Water-Bath with Magnetic Stirring (**WBMS**) and with Resistive Heating. An open-loop control is performed on a small 12 V, 1 A, DC motor (**RHOL12V**) that rotates a magnet on the air-side of the bath. While a second magnet in the water, in alignment, is stirring the water. The unidirectional motor rotation is achieved by the [Si18HyUdMTC1-50V](#) board, while the open-loop motor speed is calibrated with the 25 turn trim-pot (**Pot-RPM**) mounted on the **Si18** board. An external Optical-Relay is used to PWM control a 117 Vrms heater; maintaining constant water temperature with 1/2<sup>o</sup> C accuracy in the - 25<sup>o</sup>C to +102<sup>o</sup>C range. The temperature is measured with the accessory [Si18DTsens](#), 9-bit, digital-thermometer sensor. A low-water sensor is used to turn-off the heater-power when the water evaporates. The [Si18Pot2PB2MC8](#) accessory is used for control inputs. A 2 line by 20 characters long LCD (with HITACHI HD44780 Interface Standard) is used for Set-Temperature, Measured-Temperature, Set-RPM and Measured-RPM data display. The LCD with back-light (with 8" cable, and with two 14-pin connectors) can be ordered from Signal with part number of [Si24LCD2L20CH](#); OEM pricing is available from Sunlike Display Tech Corp. in Taiwan, <http://www.lcd-modules.com.tw>. The DC Motor can be purchased from Engineering Corp. Titusville, Florida, 32780, Phone (407)268-5500, Fax (407) 268-0505.



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