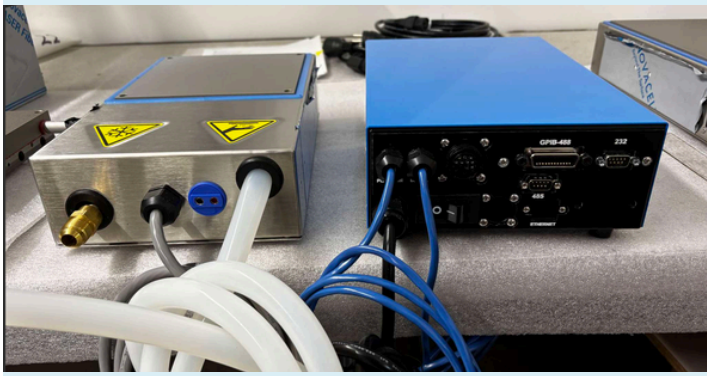
THERMAL PLATFORM SYSTEM T600, T650, AND T700

Chroma Thermal Platform Systems provide engineers with the fastest and most efficient solution for precise thermal testing of electronic devices through direct conduction technology. Designed to accelerate characterization, debugging, and reliability validation, the platform overcomes the limitations of traditional environmental chambers with extremely fast heating and cooling ramp rates, precise temperature control, and an open design that provides easy access for probing, cabling, and device tuning. automated test environments, helping engineers improve test efficiency, accuracy, and throughput.

T600, T650, AND T700

KEY FEATURES

- Precision ground aluminum alloy thermal plate
- Very fast heating & cooling ramp rates
- Extremely efficient cooling channel design
- Corrosion proof 304 stainless steel chassis
- 2nd user device under test sensor
- Ramp to set point & prog. ramp & soak profiling
- Modbus RTU EIA(RS)-232/485 serial comms
- Surface hard plated for extremely long wear
- Comes with Configurator® utility software, mold-ed serial cable & external 232 to 485 converter



Chroma

T600- THERMAL PLATFORM SYSTEMS

The T600 series of thermal platform systems is the traditional configuration offering a thermal plate with a separate & remote temperature controller. Thermal platforms offer the fastest, most convenient method of testing electronic components that may be heated and cooled by direct conduction. Not only do thermal plates offer much faster thermal cycling rates than environmental chambers, but cable connections, probing and tuning of the device under test is much more easily accomplished.

Dry boxes utilizing a dry Nitrogen (GN2) or very dry air purge system allow moisture and frost free testing below dew point. Ground & plat- ed fixturing adapter plates and our universal hold down clamping arm are quick & easy ways to attach devices to our platform. Insulated supply hoses are also available.

T600 thermal platform shown with the standard PM9 Temperature Controller

Optional F4T color touch screen controller †

Heating of the plate is provided by resistance elements and cooling by the expansion of liquid

Carbon Dioxide (LCO_2) or liquid Nitrogen (LN_2) in a computer designed and CNC machined precision channel embedded within the platform.

A large variety of standard sizes insures quick delivery of a plate that is well suited to your test requirements. Additional standard features include precision grinding and hard plating of plate surfaces, threaded 18-8 stainless steel in- serts for fixturing and a built-in thermal failsafe system.

ESS also offers special thermal platform systems to handle unique test requirements such as high power components like TWT's. A dual circuit plate with dual channel controller allows you to maintain an even temperature across the entire plate surface even with a "hot spot" generated by a TWT collector. Other plates are suited to the special needs of MIC's, Hybrids, & PCB probing.

Precision ground aluminum alloy thermal plate
Very fast heating & cooling ramp rates
Extremely efficient cooling channel design
Corrosion proof 304 stainless steel chassis
2nd user device under test sensor
Ramp to set point & prog. ramp & soak profiling
Modbus RTU EIA(RS)-232/485 serial comms
Surface hard plated for extremely long wear
Comes with Configurator® utility software, molded serial cable & external 232 to 485 converter

PM9 Controller Options:

- FM approved limit/alarm "product saver"*
- Ethernet/IP—Modbus TCP interface GPIB-488
- (not available with Ethernet option)

† For F4T features list see the ESS Controllers Feature Matrix *FM (Factory Mutual)

T600- THERMAL PLATFORM SYSTEMS

T600 Thermal Platform Ordering Information

T600 ____ ____ ____ ____ ____

Size

1	6.75” X 6.75” (17.15 cm X 17.15 cm)
2	11” X 11” (27.94 cm X 27.94 cm)
3	10” X 15” (25.4 cm X 38.1 cm)

Voltage

1	115 VAC 50/60 Hz
2	230 VAC 50/60 Hz

Coolant

1	LN_2 15-25 PSIG	(+200° C to -99° C)
2	LCO_2 300 PSIG	(+200° C to -65° C)
3	LCO_2 900 PSIG	(+200° C to -65° C)

Controller

A	PM9 w/Std. bus & Modbus RTU EIA-232/485	D	F4T-1*
B	PM9 w/Std. bus & Modbus RTU EIA-232/485 & GPIB-488	E	F4T-2*
C	PM9 w/Std. bus EIA-232/485& Ethernet/IP - ModbusTCP	F	F4T-3*

*See the F4T Feature Matrix sheet for a list of the F4T-1, F4T-2 & F4T-3 features

Country

A	Continental Europe
C	Australia/New Zealand United
D	Kingdom/Ireland
E	Denmark
F	France/Belgium India/South
G	Africa
H	Israel
I	Italy
J	Japan
K	USA (North America)
L	Switzerland
O	Russia
X	China
T	Argentina

Example: T600-113AK T600 Thermal Platform System, 6.75” X 6.75”, 115 VAC 50/60 Hz, $LCO_2$900PSIG, PM9 Controller with serial 232, North America (USA) plug on power cord

T650- THERMAL PLATFORM SYSTEMS

The T650 series of thermal platform systems is the best value configuration offering a thermal plate with an integrated temperature controller. Thermal platforms offer the fastest, most conven- ient method of testing electronic components that may be heated and cooled by direct conduction. Not only do thermal plates offer much faster thermal cycling rates than environmental cham- bers, but cable connections, probing and tuning of the device under test is much more easily ac- complished.

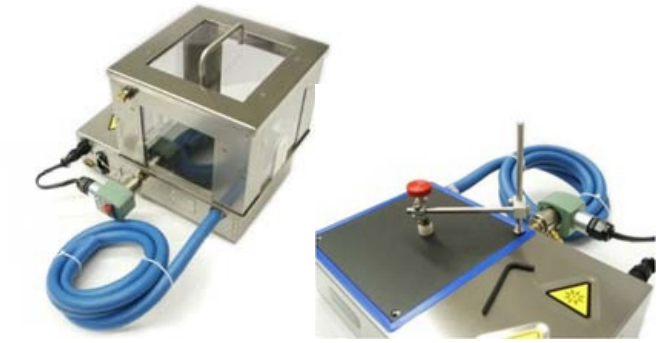
T650 thermal platform shown with the PM6 Temperature Controller

Heating of the plate is provided by resistance elements and cooling by the expansion of liquid Carbon Dioxide (LCO_2) or liquid Nitrogen (LN_2) in a computer designed and CNC ma-chined channel embedded within the platform.

Three standard sizes insure quick delivery of a plate that is well suited to your test requirements. Additional standard features include precision grinding and hard plating of plate sur- faces, threaded 18-8 stainless steel 1/4”-20 in- serts for fixturing and a fixed set point latching thermal overtemperature failsafe system. All PM controllers come with Modbus RTU protocol EIA (RS)-232/485 included.

ESS offers two temperature controller options for the standard PM6. You can add a program- mable set-point, built-in FM approved limit/alarm “product saver” or you can substitute an Ethernet/ IP—Modbus TCP serial interface in place of the 2nd user device sensor.

Dry box desiccatorsutilizing a dry Nitrogen (GN) or very dryair purge system allow moisture and frost free testing below dew point. Ground & plated fixturing adapter plates and our universal hold down clamping arm are quick & easy ways to attach devices to our platform. Insulated sup- ply hoses are also available.

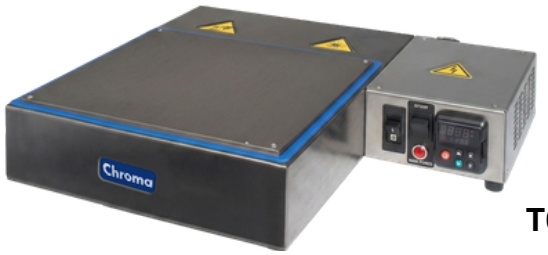


Optional dry box desiccator and universal hold down clamp shown

Precision ground aluminum alloy thermal plate
Very fast heating & cooling ramp rates
Extremely efficient cooling channel design
Corrosion proof 304 stainless steel chassis
2nd user device under test sensor
Ramp to set point & ramp & soak profiling feature
EIA(RS)-232/485 serial computer interface
Surface hard plated for extremely long wear
Optional “product saver” or Ethernet interface

Optional fixture/adapter plate and LN2 supply hose shown

T650- THERMAL PLATFORM SYSTEMS



T650 ____ ____ ____ ____ ____

Size

1	6.75” X 6.75” (17.15 cm X 17.15 cm)
2	11” X 11” (27.94 cm X 27.94 cm)

Voltage

1	115 VAC 50/60 Hz	(110 to120 VAC)
2	230 VAC 50/60 Hz	(208 to 240 VAC)

Coolant

1	LN_2 15-25 PSIG	(+130° C to -99° C)
2	LCO_2 300 PSIG	(+130° C to -65° C)
3	LCO_2 900 PSIG	(+130° C to -65° C)

PM6 Controller

B	PM6 – Ramp & soak, 232/485 serial comms, FM approved limit/alarm†, 2nd device sensor, 7-segment LED display
C	PM6 – Ramp & soak, 232/485 Standard bus and Ethernet/IP—Modbus TCP serial comms*, 7-segment LED display
D	PM6 –same as B above, and add Bluetooth/EZ-LINK, SMOOTH-TOUCH™ keypad and high resolution LCD display
E	PM6 – same as C above, and add Bluetooth/EZLINK, SMOOTH-TOUCH™ keypad and high resolution LCD display

*†Option A without FMapprovedlimit/alarm controller is no longeravailable.OrderPM6controlleroptionB *Ethernet option replaces 2nd user device sensor and FM approved integrated limit/alarm controller*

Country

A	Continental Europe (Austria, Germany, Netherlands, Spain, Sweden, etc.)
C	Australia/New Zealand
D	United Kingdom/Ireland
E	Denmark
F	France/Belgium
G	India/South Africa
H	Israel
I	Italy
J	Japan
K	USA (North America)
L	Switzerland
O	Russia
X	China
T	Argentina
Z	Stripped Leads (no plug on power cord)

Example: T650-113AK

T650 Thermal Platform System, 6.75” X 6.75”, 115 VAC 50/60 Hz, LCO2 900 PSIG, Premium PM6 Temperature Controller and USA (North America) plug and power cord

T700- THERMAL PLATFORM SYSTEMS

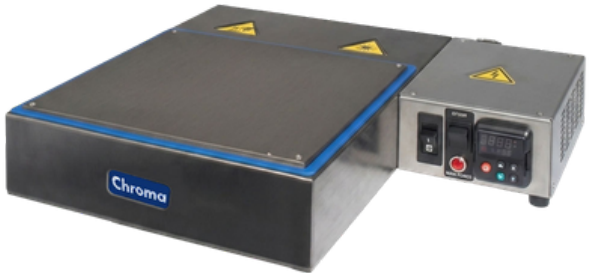
The T700 series of thermal platform systems combines the excellent component accessibility of the T600 series with the value and compact- ness of the integrated temperature controller like the T650 series. Thermal platforms offer the fast- est, most convenient method of testing electronic components that may be heated and cooled by direct conduction. Not only do thermal plates of- fer much faster thermal cycling rates than environmental chambers, but cable connections, probing and tuning of the device under test is much more easily accomplished.

Heating of the plate is provided by resistance elements and cooling by the expansion of liquid Carbon Dioxide (LCO_2) or liquid Nitrogen (LN_2) in a computer designed and CNC machined channel embedded within the platform.

Two standard sizes insure quick delivery ofa plate that is well suited to your test requirements. Additional standard features include precision grinding and hard plating of plate sur- faces, threaded 18-8 stainless steel 1/4”-20 in- serts for fixturing and a fixed set point, latching thermal overtemperature failsafe system. All PM controllers come with Modbus RTU protocol EIA (RS)-232/485 included.

ESS offers three temperature controller options to the standard PM6 temperature controller. You can add a programmable set-point, built-in FM approved limit/alarm “product saver” or you can substitute an Ethernet/IP—Modbus TCP seri- al interface in place of the 2nd user device sen- sor. Lastly you can upgrade to the PM9 controller and get both the 2nd user device sensor or “product saver” and the Ethernet/IP - Modbus TCP serial interface.

Dry box desiccatorsutilizing a dry Nitrogen (GN_2) or very dryair purge system allow moisture and frost free testing below dew point. Ground & plated fixturing adapter plates and our universal hold down clamping arm are quick & easy ways to attach devices to our platform. Insulated sup- ply hoses are also available.



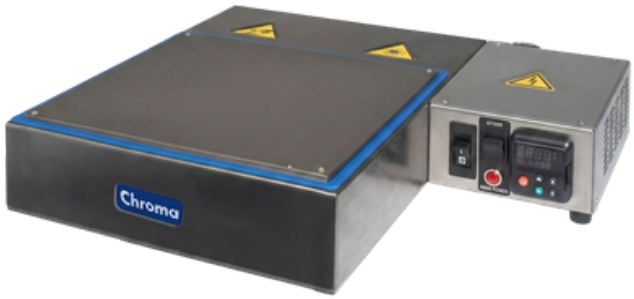
T700 thermal platform shown with the PM6 Temperature Controller

Optional PM9 controller and IEEE/GPIB-488 shown

Precision ground aluminum alloy thermal plate
Very fast heating & cooling ramp rates
Extremely efficient cooling channel design
Corrosion proof 304 stainless steel chassis
2nd user device under test sensor
Ramp to set point & ramp & soak profiling feature
EIA(RS)-232/485 serial computer interface
Surface hard plated for extremely long wear
Optional “product saver”, Ethernet or GPIB-488

Optional fixture/adapter plate and LN2 supply hose shown

T700- THERMAL PLATFORM SYSTEMS



T700 Thermal Platform Ordering Information

T700 _____ _____ _____ _____ _____ _____

Size

1	6.75” X 6.75” (17.15 cm X 17.15 cm)
2	11” X 11” (27.94 cm X 27.94 cm)

Controller

1	PM6 withramp & soak profiling & 2nd user device sensor
2	PM6 as above with *FM approved integrated limit/alarm controller (“product saver”)
3	PM9 withramp & soak profiling & 2nd user device sensor
4	PM9 as above with *FM approved integrated limit/alarm controller (“product saver”)

*FM (Factory Mutual)

Voltage

1	115 VAC 50/60 Hz
2	230 VAC 50/60 Hz

Coolant

1	LN_2 15-25 PSIG (1.0 – 1.7 bar)	range:	(+130° C to -99° C)
2	LCO_2 300 PSIG (20 bar)	range:	(+130° C to -65° C)
3	LCO_2 900 PSIG (62 bar)	range:	(+130° C to -65° C)

Communications

1	Std. bus & Modbus RTU protocol EIA(RS)-232/485 serial comms
2	Std. bus & Modbus RTU protocol EIA(RS)-232/485 serial comms & GPIB-488 (requires PM9 controller)
3	Ethernet/IP – Modbus TCP communications ǂ

ǂ If you choose the PM6 controller you have a choice of the either the *FM approved integrated limit/alarm controller option or the Ethernet/IP – Modbus TCP communications option.

Country

A	Continental Europe
C	Australia/New Zealand
D	United Kingdom/Ireland
E	Denmark
F	France/Belgium
G	India/South Africa
H	Israel
I	Italy
J	Japan
K	USA (North America)
L	Switzerland
O	Russia
X	China
T	Argentina
Z	Universal power cord with stripped leads (no country specific plug included)

Example: T70011111K

T700 Thermal Platform System, 6.75” X 6.75” thermal plate, Integrated PM6 controller, 115 VAC 50/60 Hz, LN_2 15-25 PSIG, EIA-232/485 serial communications, North America (USA) plug on power cord

OPTIONAL ACCESSORIES

Foam Insulated LN_2 Hose
Part number **24-0016**

Vacuum insulated LN_2 Supply Hose Part number **024-0067**

Foam Insulated LCO_2 Hose
Part number **024-0013**

Adapter Fixture Plate
Part number **SeeReverse**

Hold Down Clamp
Part number **024-0021**

Dry box purgeable enclosure
Part number **See Reverse**

Low Pressure Purge Kit
Part number **024-0022**

High Pressure Purge Kit
Part number **024-0023**

GPIB-488 Communications
Part number **024-0038**

OPTIONAL ACCESSORIES

Adapter Fixture Plates

Item	Size	Part No.
1	6.75” X 6.75” (17.15 cm X 17.15 cm)	**024-0024**
2	6.75” X 13.25” (17.15 cm X 33.66 cm)	**024-0026**
3	6.75” X 20.00” (17.15 cm X 50.80 cm)	**024-0027**
4	6.75” X 26.25” (17.15 cm X 50.80 cm)	**024-0028**
5	11” X 11” (27.94 cm X 27.94 cm)	**024-0030**
6	11” X 22” (27.94 cm X 55.88 cm)	**024-0031**
7	10” X 15” (25.4 cm X 38.1 cm)	**024-0029**
8	15” X 15” (38.1 cm X 38.1 cm)	**024-0046**
9	18” X 22” (45.75 cm X 55.88 cm)	**024-0053**

Dry Box

Item	Size	Part No.
1	6.75” X 6.75” (17.15 cm X 17.15 cm)	**024-0004**
2	6.75” X 13.25” (17.15 cm X 33.66 cm)	**024-0005**
3	6.75” X 20.00” (17.15 cm X 50.80 cm)	**024-0006**
4	6.75” X 26.25” (17.15 cm X 50.80 cm)	**024-0007**
5	11” X 11” (27.94 cm X 27.94 cm)	**024-0009**
6	11” X 22” (27.94 cm X 55.88 cm)	**024-0010**
7	10” X 15” (25.4 cm X 38.1 cm)	**024-0008**
8	15” X 15” (38.1 cm X 38.1 cm)	**024-0001**
9	18” X 22” (45.75 cm X 55.88 cm)	**024-0052**

PM6, PM9 & RMC CONTROLLER

Feature Matrix	PM6*	PM9*	RMC*
Programmable ramp to set point	●	●	●
Profiling Ramp & Soak Standard bus protocol EIA(RS)-	●	●	●
485 serial communications Modbus RTU protocol EIA(RS)-	●[1]	●	●
485/232 serial communications Ethernet/IP –	●[1]	●	●
Modbus TCP/IP protocol serial communications	○[2]	○[2]	○[2]
2nd sensor input for device under test temperature monitoring	●	●	●
Integrated FM approved limit alarm controller (“product saver”)	○	○	○
Cascade PID Control	◊	◊	◊
Multiple PID sets with automatic programmable PID crossover 4.3-	◊	◊	◊
inch high resolution color graphical touch panel	◊	◊	◊
Data logger	◊	◊	◊
Graphical trend charts	◊	◊	◊
Display screen custom personalization Free Configurator® text-	◊	◊	◊
based programming PC software	●	●	●
Free Composer® Graphical programming PC software	◊	◊	●
Programmable logic function blocks	◊	◊	●
Provision to field upgrade firmware features	◊	◊	◊
Provision for field installable analog & digital I/O hardware modules	◊	◊	◊
Two USB host ports for data transfer	◊	◊	◊
LabVIEW™ driver for Standard bus protocol EIA-485/232 serial comms	●	●	●
LabVIEW™ driver and SCPI protocol for Ethernet	◊	◊	◊
GPIB-488	○	○	○
Approvals: UL®, FM, CE, RoHS, W.E.E.E., CSA, NEMA 4X/IP65 or IP66	●	●	●

* The PM6 temperature controller is used with the T650 and T700 series thermal platform systems. The PM9 temperature controller is used with the T600 series thermal platform systems. The RMC temperature controll er is only used with MRTP thermal platform systems

● Included

○ Optional

◊ Unavailable

Notes:

1. The PM6 comes with EIA(RS)-485 serial communications. EIA(RS)-232 serial communications is provided by an external 485 to 232 converter included with the system. Standard bus or Modbus RTU protocol is software selectable within the Communications
2. Page of the Setup Menu. Ethernet/IP – Modbus TCP/IP protocol serial communications is available on the PM6 in place of the 2nd sensor input for device under test temperature monitoring or the product saver limit/alarm controller.
   Ethernet/IP –Modbus TCP/IP protocol serial communications is available in place of the Modbus RTU protocol EIA(RS) 485/232 serial communications on the PM9 and RMC controllers. The SCPI protocol limited command set is not available with the Ethernet option on PM6, PM9 or RMC controllers.

F4T FEATURE MATRIX

Feature Matrix	F4T-1*	F4T-2*	F4T-3*
Programmable ramp to set point	●	●	●
Programmable Profiling - Ramp & Soak	●	●	●
Standard bus protocol EIA(RS)-485 serial communications	◊	◊	◊
Modbus RTU protocol EIA(RS)-485/232 serial communications	●	●	●
Modbus TCP & SCPI protocol Ethernet communications ǂ	●	●	●
2nd sensor input for device under test temperature monitoring	●	●	●
Integrated FM approved limit alarm controller (“product saver”)	◊	●	●
Cascade PID Control	◊	●	●
Five (5) PID sets with automatic PID crossover	●	●	●
4.3-inch high resolution color graphical touch panel	●	●	●
Data logger	◊	◊	●
Graphical color trend charts	◊	◊	●
Display screen custom personalization	●	●	●
Free Configurator® text-based programming PC software	◊	◊	◊
Free Composer® graphical programming PC software	●	●	●
Programmable logic function blocks	●	●	●
Provision to field upgrade firmware features	●	●	●
Provision for field installable analog & digital I/O hardware modules	●	●	●
Two USB host ports for data transfer	●	●	●
LabVIEW™ driver for Standard bus protocol EIA-485/232 serial comms	◊	◊	◊
LabVIEW™ driver for Standard Bus & SCPI protocol Ethernet ǂ	●	●	●
GPIB-488	○	●	●
Approvals: UL®, FM, CE, RoHS, W.E.E.E., CSA, NEMA 4X/IP65 or IP66	●	●	●

*The F4T controller can be used with the T600 series and MRTP thermal platform systems

ǂ The F4T Ethernet does not support Virtual Instrument Software Architecture (VISA) or Ethernet/IP protocol. The F4T Ethernet does support Modbus TCP/Specview® on port 502., Limited SCPI commands on port 5025., Composer, Standard Bus, and LabVIEW driver on port 44819. The SCPI protocol for Ethernet is a limited command set. Contact ESS, Inc. for the list of available SCPI commands

● Included

○ Optional

◊ Unavailable