CT104 Manual

Rugged Enclosure System for Embedded PC/104 Systems

Manufactured by
TRI-M ENGINEERING
Engineered Solutions for Embedded Applications

Technical Manual

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PREFACE

This manual is for integrators of applications of embedded systems. It contains information on hardware requirements and interconnection to other embedded electronics.

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CHAPTER 1: INTRODUCTION

1.1 Description

Tri-M's PC/104 Can-Tainer™ is a new and unique design specifically intended to protect PC/104 electronics such as instrumentation, data collectors, remote terminals, SCADA packages or other solutions that operate in hostile environments. The Can-Tainer™ is constructed of 0.125" aluminium that can accommodate any number of PC/104 modules including their cabling and peripherals, with maximum flexibility in a minimum amount of space. Surprisingly, these units are also priced to be used anywhere embedded electronics require a black box.

When deploying electronics in mobile or vehicle applications, vibration and G-forces can greatly reduce their life expectancy and reliability. The Can-Tainer™ ensures the PC/104 modules receive maximum protection from vibration and G-forces. This is accomplished using Tri-M's dual system of isolating and absorbing rubber mountings. Internally, each of the four corners of the PC/104 stack is held in place by a rubber corner system, which isolates the PC/104 cards from the extruded aluminum enclosure as it absorbs high frequency vibration. Externally, the anodized aluminum enclosure mates with a thick rubber-mounting pad allowing the Can-Tainer™ to be attached to a bulkhead while it absorbs low frequency G-forces. The rubber pad is optional and may be removed.

A wide variety of end caps are available for the Can-Tainer™ including openings for DB9, DB15, DB25 and RJ45s. Custom end caps with any combination of connector holes can be supplied to meet specific client requirements. The Can-Tainer™ is NEMA rated when used with optional end cap gaskets, appropriate end cap and connectors. Each anodized aluminium end cap is securely attached to the housing with eight self-tapping, hex head machine screws. The standard black anodized Can-Tainer™ measures 5.4" x 6.0" (L x W) and comes in five standard heights of 4", 6", 8", 10" and 12". The Can-Tainer™ Kit includes one solid end cap with no I/O openings (Part # CTEC00), one I/O end cap with openings for four DB9s & two DB25s (Part # CTEC01), sixteen end cap screws and one mounting kit. The mounting kit has two gaskets, four rubber corner guides, eight rubber corner stops, one tube of CA glue and one external thick rubber anti-shock mounting pad.

To mount boards or items such as hard drives that are larger than 3.550" x 3.775", use the optional CTn-VD00 mounting plates. These install into rails that run the length of the enclosure. For smaller items, an optional PC/104-size aluminum plate, CT-AL00, enables you to mount accessories directly onto the PC/104 stack.

An optional fan kit (CT-FAN) provides forced air-cooling. To provide airflow through the Can-Tainer™, drill intake holes at the point where the fan is mounted and exhaust holes at one additional location (usually at one end cap). For a sealed environment with only conduction cooling, the fan may be mounted offset from the enclosure wall using custom hardware.

The Can-Tainer™ cross-section measures 6.00" wide by 5.45" high (not including mounting pad). It is available in seven standard lengths of 2", 4", 5", 6", 8", 10", and 12" (order no. CT-n where n = length in inches). To calculate the height of your PC/104 stack, refer to the Table 1. To compute the length of the Can-Tainer™ needed, add the appropriate room at each end for cabling. Usually about one inch of additional room is needed at any end that will have one or two cables. Further, up to two inches for more cables, depending on how the cables are routed inside the enclosure.

1.2 Features:

- Rugged anodized aluminum
- Securely holds PC/104 modules
- Internal stack vibration mount
- External isolating shock mount
- I/O end caps
- NEMA sealed with end cap gaskets
- PC/104 Can-Tainer available sizes in 2", 4", 5", 6", 8", 10" and 12"
- Custom sizes available

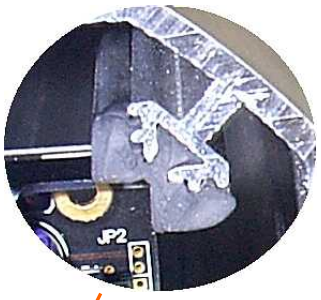

Figure 1: Corner Mounting Rubber

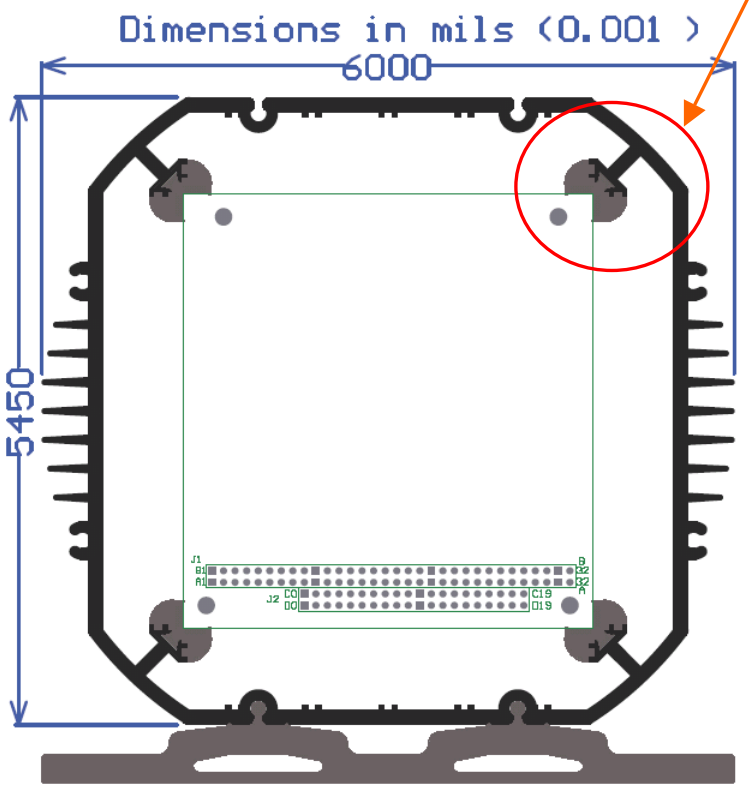

Figure 2: Can-Tainer™ with PC/104 Card

1.3 Can-Tainer™ Kit Includes:

- 1x Can -Tainer™ body 2", 4", 5", 6", 8", 10" or 12"
- 1x CT-EC00, Solid End cap
- 1x CT-EC01, End cap with 4x DB9 and 2x DB 25
- 1x Anti-shock mounting pad
- 2x CT-EC gaskets
- 4x Corner guides
- 8x Corner rubber stops
- 1x Tube CA glue
- 16x End cap screws

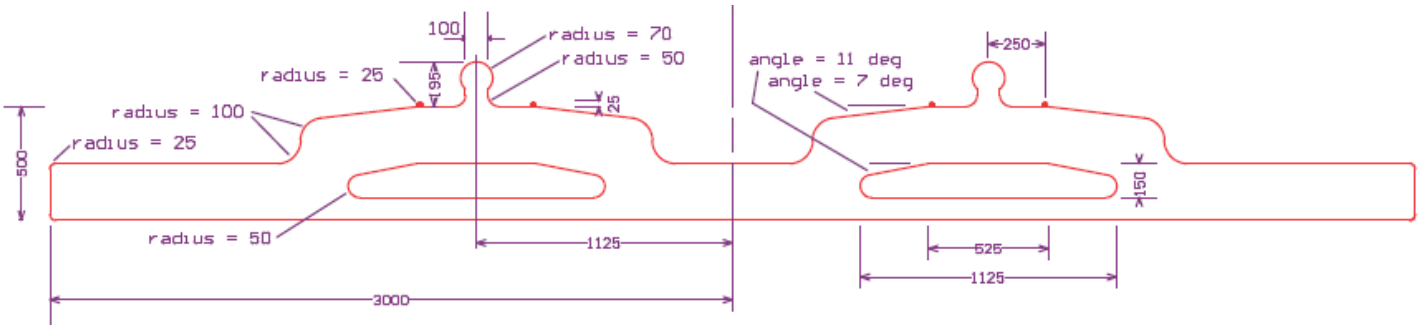

Figure 3: Cross Section of Shock Mount Pad

CHAPTER 2: Custom Board Mounting

PC/104 modules may be mounted horizontally method (HM) or vertically method (VM). In the HM method, the PC/104 modules are securely held by the rubber corner system. Accessory equipment, such as batteries and transmitters, may be attached to a PC/104-AL mounting plate and included in the PC/104 stack.

# Boards	1st Board / Non-Stackthrough	1st Board / Stackthrough
1	0.62	0.92
2	1.26	1.58
3	1.92	2.24
4	2.58	2.90
5	3.25	3.57
6	3.91	4.23
7	4.57	4.89
8	5.23	5.55
9	5.89	6.21
10	6.56	6.88

Table 1, Board Stack Heights

For the VM method, the PC/104 stack is mounted to a vertical divider, CT6-VD00 or CT8-VD00. The vertical divider with the PC/104 stack installed is then slid into the vertical card slots in the Can-Tainer™ case. Accessory equipment, such as batteries and transmitters, may be attached to the opposite side of the vertical divider.

CHAPTER 3: Can-Tainer™ Material Specifications

3.1 Aluminum Housing Materials

Alloy - 6063-T5 Aluminum Extrusion

Finish - Black Anodized. Other finishes available.

Table C:
Typical Properties of 6063-T5 Aluminum Extrusion Alloy*

Physical Property	Value
Average Coefficient of Thermal Expansion	13.0 µin/°F (68° - 212 °F)
Approximate Melting Range	1140°F - 1210°F
Thermal Conductivity	1450 BTU - in/ft² hr °F (@ 77°F)
Electrical Resistively	2.8 µOhm-cm (@ 68°F)
Ultimate Strength	27,000 PSI
Yield Strength	21,000 PSI
Elongation	12% (% in 2 in, 1/16" thick specimen)
Hardness Brinell No.	60 (500 kg load, 10 mm ball)
Ultimate Sheer Strength	17,000 PSI
Fatigue Endurance Limit	10,000 PSI (500 x 106 cycles Moore Mach.)
Modulus of Elasticity	10 (106 PSI)
* Source: Aluminum Standards and Data, 1988 Aluminum Association Inc.	

3.2 Rubber Mounting Materials

Compound - High Grade EPDM 80 extruded rubber
Rating - ULHB94 Horizontal Burn Test, compound # 295-104-02-90

ETHYLENE PROPYLENE COPOLYMER (EPM/EPDM) Elastomers prepared from ethylene and propylene monomers, at times with a small amount of a third monomer (Etlylene Propylene Terpolymer). Excellent resistance to phosphate ester type hydraulic fluids.

Specific gravity.....86
Tensile Strength.....3,000
Elongation, max.....6x
Hardness, Shore A.....30-90
Brittle Point (F).....-90

The hardness testing of plastics is most commonly measured by the Shore (Durometer) test or Rockwell hardness test. Both methods measure the resistance of the plastic toward indentation. Both scales provide an empirical hardness value that doesn't correlate to other properties or fundamental characteristics. Shore Hardness, using either the Shore A or Shore D scale, is the preferred method for rubbers/elastomers and is also commonly used for 'softer' plastics such as polyolefins, fluoropolymers, and vinyls. The Shore A scale is used for 'softer' rubbers while the Shore D scale is used for 'harder' ones.

The Shore hardness is measured with an apparatus known as a Durometer and consequently is also known as 'Durometer hardness'. The hardness value is determined by the penetration of the Durometer indenter foot into the sample. Because of the resilience of rubbers and plastics, the hardness reading my change over time - so the indentation time is sometimes reported along with the hardness number. The ASTM test method designation is ASTM D2240 00. Related methods include ISO 7619 and ISO 868; DIN 53505; and JIS K 6301, which was discontinued and superseded by JIS K 6253.

The results obtained from this test are a useful measure of relative resistance to indentation of various grades of polymers. However, the Shore Durometer hardness test does not serve well as a predictor of other properties such as strength or resistance to scratches, abrasion, or wear and should not be used alone for product design specifications.

As seen in the charts below, the correlation between the two Shore Durometer hardness scales is weak; attempts at conversion between the scales are therefore discouraged. The correlation is higher for materials with similar resiliency properties, but is still too low for reliable conversions. Likewise, conversion between Shore Hardness and Rockwell hardness is discouraged.