FlexTainer Manual

Rugged Enclosure System for Embedded 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.

DISCLAIMER

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CHAPTER 1: INTRODUCTION

1.1 Description

Tri-M's FlexTainer™ is a new and unique design specifically intended to protect embedded electronics such as instrumentation, data collectors, remote terminals, SCADA packages or other solutions that operate in hostile environments. The FlexTainer ™ is constructed of 0.125" aluminium that can accommodate Epic, Mini-ITX, PC/104, ETX and other modules including their cabling and peripherals, with maximum flexibility in a minimum amount of space.

Deploying electronics in mobile or vehicle applications, vibration and G-forces greatly reduce product life expectancy and reliability. The FlexTainer™ ensures the 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 carrier plate is held in place by a rubber corner system, which isolates the 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 FlexTainer ™ to be attached to a bulkhead while it absorbs low frequency G-forces. The rubber pad is optional and may be removed.

A solid (no openings) end cap is included with the FlexTainer kit. Custom end caps with any combination of connector holes can be supplied to meet specific client requirements. The FlexTainer™ is NEMA rated when used with optional end cap gaskets, and appropriate 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 FlexTainer™ measures 7" x 4.0" (W x H) and comes in three standard lengths of "Epic" (116mm), "ITX" (172mm), and 10". The FlexTainer™ Kit includes one solid end cap with no I/O openings (Part # CT-EC00), sixteen end cap screws and one shock mount pad and a carrier plate with mounting rubber.

Features:

- Rugged anodized aluminum
- Securely holds embedded modules
- Internal vibration mount
- External isolating shock mount
- I/O end caps
- NEMA sealed with end cap gaskets
- FlexTainer available sizes in “Epic” (116mm), “ITX” (172mm), and 10"
- Custom sizes available

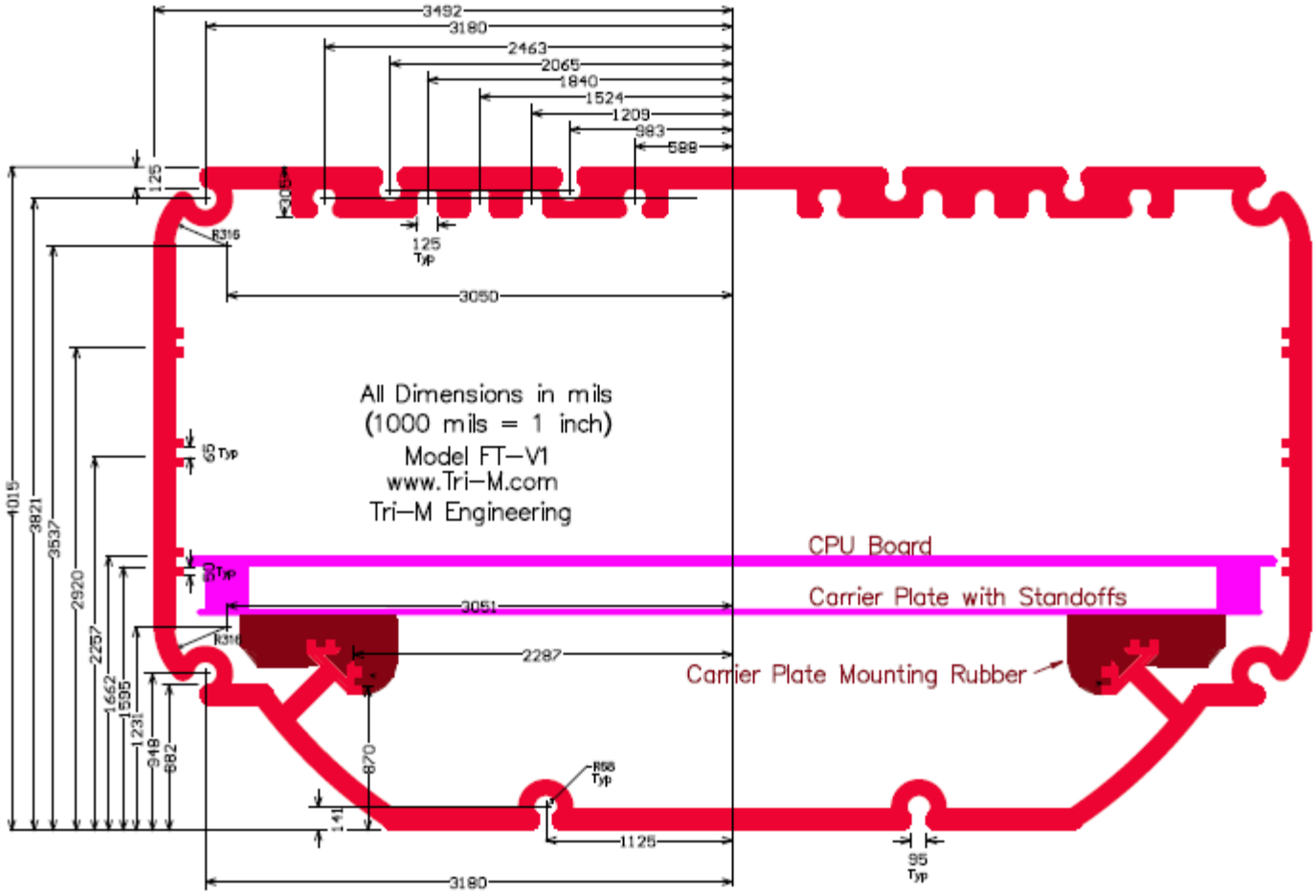
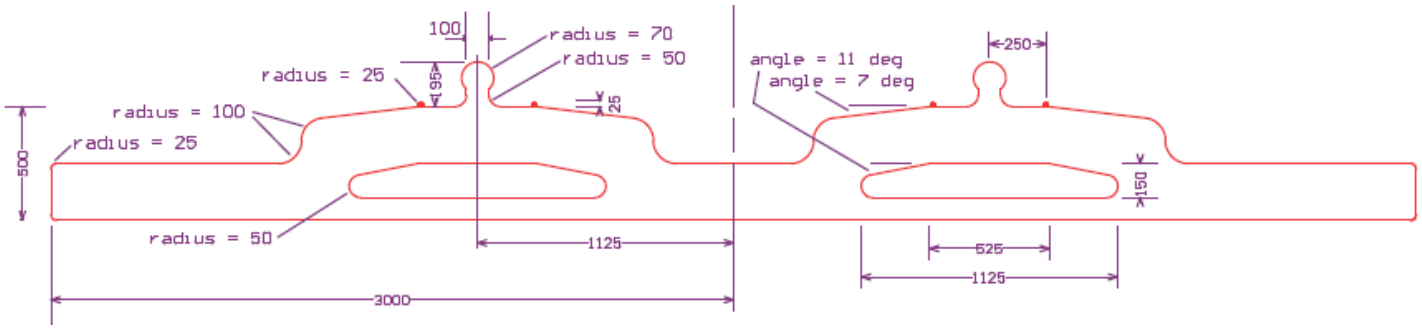


Figure 2: FlexTainer™ with carrier Card

1.2 FlexTainer™ Kit Includes:

- 1x FlexTainer™ body “Epic” (116mm), “ITX” (172mm), and 10"
- 1x FT-EC00, Solid End cap
- 1x Anti-shock mounting pad
- 4x EBX Corner guides
- 1x Carrier plate, Epic, ITX or ETX.
- 16x End cap screws

Figure 3: Cross Section of Shock Mount Pad



CHAPTER 2: PC/104 Module Mounting

Up to three PC/104 modules may be mounted directly onto one of the carrier cards (FT-MTG-Epic, FT-MTG-ITX or FT-MTG-EBX) or two mounted onto an Epic, ITX or EBX motherboard.

CHAPTER 3: FlexTainer™ 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.