



PROTOTYPE BUILD DESCRIPTION

Poseidon Scientific Instruments MWA Receiver Node Prototype

VERSION: 1.0

REVISION DATE: 28/07/10

Approver Name	Title	Signature	Date
Ian Moore	Technical Manager		
Derek Carroll	Production Engineer		

Contents

Section 1.	Introduction.....	1
1.1	Purpose.....	1
1.2	Scope.....	1
Section 2.	Prototype Assembly Status.....	2
2.1	Introduction.....	2
2.2	Procurement.....	2
2.3	Assembly, Integration and Basic Testing.....	2
2.4	As Built Drawings.....	2
2.5	Assembly Procedures.....	2
2.6	Surplus Materials.....	2
Section 3.	Status Details.....	3
3.1	MST-0432 (v0.052) {MWA Receiver Node Enclosure}.....	3
3.2	MST-0448 (v0.005) {MWA Internal Rack}.....	3
3.3	MST-0423 (v0.000) {MWA Digital Rack}.....	3
3.4	MST-0422 (v0.003) {MWA ASC Module}.....	4
3.6	MST-0429 (v0.002) {MWA PSU Module}.....	4
3.7	MST-0426 (v0.005) {SBC Module}.....	5
3.8	MST-0417 (v0.002) {MWA ATIM-C PCB – part of SBC}.....	5
3.9	MST-0431 (v0.004) {MWA Dual TempMon – part of SBC}.....	6
3.10	MST-0418 (v0.000) {MWA ATIM-T PCB}.....	6
3.11	MST-0424 (v0.000) {MWA Air Conditioner Unit}.....	7
3.12	MST-0420 (v0.002) {MWA AC Control Box}.....	7
3.13	Cables.....	7
Section 4.	As Built Drawings.....	8
4.1	Electronic Files.....	8
Section 5.	Assembly Procedures.....	9
5.1	Electronic Files.....	9
Section 6.	Surplus Materials.....	10
6.1	Surplus Materials List.....	10
Section 7.	Revision History.....	11

Section 1. Introduction

1.1 Purpose

This document describes the “as is” status of the prototype receiver node. The contract required that PSI purchase and procure the materials necessary to complete ONE prototype based on the accepted design proposed in the original service contract 21035. This document consists of a collation of information gathered during the building of this prototype and the status of each item as indicated on the schedule of deliverables provided by PSI. This document provides an overview and introduction to the detailed items being supplied.

1.2 Scope

This document covers the detailed build status of ONE prototype receiver:

- a) Status of the “named” assemblies, with regards to assembly, Integration and basic testing.
- b) Details of PCB modifications required to achieve operational units. Altium files have not been updated and are not included in this phase of the project.
- c) Details of mechanical modifications to achieve operational units. Drawings where possible have been updated and are provide with this release in PDF format for review.
- d) Some assembly details are provided, where appropriate complexity requires explanation showing the system build process adopted.
- e) Final cable drawings are provided in PDF format.

Section 2. Prototype Assembly Status

2.1 Introduction

The prototype assembly status is set out in five sections as itemised in the schedule of deliverables provided in contract 22054. A summary is given below with more details provided in the following sections.

2.2 Procurement

The purchasing and procurement of materials for the construction of ONE prototype receiver has been complete and these parts have been successfully used to build the defined equipment which is supplied as a partially completed item less the DoC PCB's, the Clock PCB and all the Digital Cards.

2.3 Assembly, Integration and Basic Testing

The assembly, integration and basic testing have been completed on the following items:

- a) ASC Modules (PCB plus enclosure heat-sinks) – 2-off
- b) ATIM-T (Transition PCB) – 2-off
- c) PSU Module (PCB & PSU plus enclosure) – 1-off
- d) Air Conditioner Control Box (Enclosure & interconnecting cables) – 1-off
- e) Digital Crate (Metalwork Only) – 1-off
- f) SBC Module (SBC, IO, ATIM-C & PSU PCB's plus Media converter and all interconnecting cables) – 1-off
- g) One fully completed main enclosure with air conditioner.
- h) One complete set of module and interconnecting cables

2.4 As Built Drawings

A set of mechanical drawing updated with the modifications required to achieve a valid assembly has been completed and these drawing are supplied as part of this release.

2.5 Assembly Procedures

Assembly procedures for the more complex items, plus cable assemblies are included in this release. Simple assembly items and standard manufacturing processes are not included.

2.6 Surplus Materials

The purchasing and procurement of materials for the prototype receiver required that minimum order quantities were necessary plus some extras for wastage during production. The surplus items currently reside in PSI stores and will be provide at the request of the MWA project team. These items can be used as spares to the project or roll-over into the next build phase.

Section 3. Status Details

3.1 **MST-0432 (v0.052) {MWA Receiver Node Enclosure}**

Status: Completed

The prototype receiver node enclosure is completed and ready for delivery to MWA when required. This can either be as a complete assembly or as individual parts as needed.

The following modifications have been incorporated into the design during construction:

- a) The enclosure was not fully seam welded as indicated on the drawings, so required the addition of copper foil on the internal seams to make it RF tight plus seam filling using Sikaflex (waterproofing compound) on the outside to weatherproof the enclosure.
- b) Inserting the insulating foam into the enclosure requires a correct order of assembly and an assembly document has been produce to explain this. See attached documentation.
- c) A new ATIM-T PCB and DoC PCB enclosure panel needed to be designed to simplify the assembly process. See new drawings for details.
- d) The enclosure lid strengthening has been changed from wood (3mm) to steel (0.6mm) and this has required changes to the drawings to accommodate this change.
- e) The air conditioner drain piping has been finalised and the changes have been incorporated in the design.
- f) Minor modifications to the metalwork are listed on the supplied drawings. See attached documentation.
- g) Temperature Sensors for the air conditioner and the enclosure have been finalised some metalwork changes were required. See attached documentation.

3.2 **MST-0448 (v0.005) {MWA Internal Rack}**

Status: Completed

The Internal Rack is the sub-system assembly including all the internal electronics of the receiver. Some minor modifications to the metalwork are listed on the supplied drawings. See attached documentation.

3.3 **MST-0423 (v0.000) {MWA Digital Rack}**

Status: Completed

The digital rack assembly is a sub-system level assembly all the Mechanical parts have been assembled ready for delivery, there were no modifications required for this sub-system.

3.4 **MST-0422 (v0.003) {MWA ASC Module}**

Status: Completed

This module contains ASC PCB. Two modules have been fully assembled and had basic power-up tests performed. Further RF testing will be carried out on this module during the next phase of the project. The following modifications and design notes have been incorporated into the design during construction:

- a) Due to a variation in the F-type connector dimensions, the PCB was unable to be inserted into its enclosure. The enclosure metal work was modified to accommodate a larger tolerance on these connectors.
- b) The PCB assembler reported that the F-Type connector pitch was not quite right. F-type connector dimensions need to be more tightly controlled. This will be reviewed in the next phase of the project.
- c) The PCB assembler reported that the PAT-01 part needs a layout change on the PCB else assembly mistakes will occur. MWA review required.
- d) The PCB assembler reported that DS75 (U102) footprint was too small and needed to be changed for future production otherwise errors would occur. MWA review required.
- e) PCB assembler reported that the pad lengths on DAT-31 parts (U3 & U5) were too short for consistent assembly.
- f) PCB assembler reported that the F-Type connectors were difficult to solder as they would not “wet” correctly which can cause dry joints. The quality of F-Type needs to be reviewed.
- g) The P100 & P101 connectors are currently just tin-plated. The more robust gold-plated versions should be considered by MWA.

3.6 **MST-0429 (v0.002) {MWA PSU Module}**

Status: Completed

The PSU Module is a sub-system level assembly. One module has been fully assembled and had basic power-up and control tests performed. Further testing will be carried out on this module during the next phase of the project. The following modifications and design notes have been incorporated into the design during construction:

- a) During assembly it was found that the PCB numbering and connections for connector J1 were for a **female** connector (Not Male as per the design, this was a PSI Altium Library part error). This has resulted in the J1 connector being changed. This means that the mating cable was also required to be changed. MWACAB-0021 is now version B.
- b) During testing it was found that the module defaulted to the “ON” state. This means loss or removal of the control signals would result in power being supplied from the module. This is not an ideal situation, so a reversing logic modification was made to allow the

PSU to fail to the “OFF” state. PCB artwork changes will need to be reviewed in the next phase of the project.

- c) PCB artwork error was discovered due to a supply line being named incorrectly (+5Vmcc and +5MCC). PCB wire mod was made to correct this.
- d) PCB artwork error on connectors P12 & P15. The +5V and OV pins were incorrectly chosen. PCB wire mods were made to correct this.
- e) An insulating boot and protective mains cover for the PSU input needs to be added to the assembly, to meet mains safety requirements.

3.7 **MST-0426 (v0.005) {SBC Module}**

Status: Completed

The SBC module is a sub-system level assembly. One module has been fully assembled and had basic power-up, control and some software tests performed. Further testing will be carried out on this module during the next phase of the project. The following modifications and design notes have been incorporated into the design during construction:

- a) During assembly it was found that the mechanical arrangement required a number of changes which has result in major changes to the metalwork for this unit. See attached documentation
- b) An in-line connector needed to be added to allow for the lid and fan to be removed easily.
- c) An insulating boot and insulation to the transformer cover was required to improve mains safety for the mains wiring.
- d) Some minor cabling changes were required due to the new mechanical arrangement.
- e) Changes to internal cable MWACAB-0033 due to PCB errors. See ATIM-C (d) below.
- f) Changes to internal cable MWACAB-0040 due to PCB errors. See ATIM-C (e) below.

3.8 **MST-0417 (v0.002) {MWA ATIM-C PCB – part of SBC}**

Status: Completed

The ATIM-C PCB is a glue-logic control board that interfaces to all the major sub-systems in the receiver node. One PCB has been fully assembled and had basic power-up and some control tests performed. Further testing will be carried out on this module during the next phase of the project. The following modifications and design notes have been incorporated into the design during construction:

- a) The PCB assembler reported that the LED's OL-330 (D7 & D8) were mounted backwards. There is a inconsistency from the LED manufacturer. There are two datasheets that conflict meaning it is difficult to determine which way round the device should be mounted. A re-artwork is required to remove this error by defining the part footprint more accurately.

- b) An incorrect footprint for diodes D1, D2, D3, D4, D5, and D6 was used. This resulted in all these parts being mounted backwards. Either a re-artwork is required or an alternate version of the diode be sourced.
- c) The PCB assembler requested that the following connectors: P2, P3, P4, P5, P6, P7, J4 and J5 have better footprints so that after assembly it is possible to see the part is orientated correctly
- d) Connectors P4 and P6 required wiring changes. See SBC (e) above.
- e) Connector J1 required wiring changes. See SBC (f) above.

3.9 **MST-0431 (v0.004) {MWA Dual TempMon – part of SBC}**

Status: Completed

The dual octal temperature sensor assembly takes two generic PCB's and fits with extra parts to make an assembly. Two dual TempMon's have been fully assembled and had basic power-up-tests performed. Further testing will be carried out on this module during the next phase of the project. The following modifications and design notes have been incorporated into the design during construction:

- a) The connectors J1 and J4 have been laid out as **female** connectors, but male connectors are specified and fitted (This error was inherited from MWA). This numbering will not be changed as the pinouts are correct to the cabling and circuit function.
- b) A 3V3 regulator is fitted but not required for this version of the assembly. MWA to review future builds to reduce costs and assembly of this part.
- c) A modified set of assembly fixings were required as the height between PCBs was changed in the SBC assembly.
- d) Also associated with (c) above interconnecting pins P1 and P3 need to be cropped to 11mm to mate correctly.
- e) The I2C address resistors need to be modified to agree with the defined access addresses 0x94 and 0x96.

3.10 **MST-0418 (v0.000) {MWA ATIM-T PCB}**

Status: Completed

The ATIM-T PCB is a transition board that interfaces to the DoC PCBs in the receiver. Two ATIM-T PCB's have been fully assembled and had basic power-up tests performed. Further testing will be carried out on these PCB's during the next phase of the project. The following modifications and design notes have been incorporated into the design during construction:

- a) The PCB assembler reported that the LED's OL-330 (D5, D6, D7 and D8) are mounted backwards. There is a inconsistency from the LED manufacturer. There are two datasheets that conflict meaning it is difficult to determine which way round the device should be mounted. A re-artwork is required to remove this error by defining the part footprint more accurately.

- b) During testing it was found that the solid state relays were designed in the wrong place resulting in the destruction of the sensor chips which follows. The PCB has been modified to correctly place the relay on the output of the sensor chip. The Relay footprint was also incorrect. A re-artwork of this PCB will be required in the next phase of the project.
- c) During testing a PCB artwork error was found, two tracks between F2 and P1 pin7 were shorted together. This error was not picked up by the Altium design rules checking because the tracks are at 45 degrees; an Altium bug only checks horizontal and vertical spacing's. A re-artwork of this PCB will be required in the next phase of the project.

3.11 **MST-0424 (v0.000) {MWA Air Conditioner Unit}**

Status: Completed

The ACU is a sub-system level assembly. One unit is completed and ready for delivery to MWA when required. The following modifications have been incorporated into the design during construction:

- a) The mounting foam was missing from the original parts list
- b) A wiring modification and cable gland was required to connect correctly to the condenser fan assembly.
- c) Sealing compound to replace seals removed during the re-wiring process was missing from the parts list.

3.12 **MST-0420 (v0.002) {MWA AC Control Box}**

Status: Completed

The AC Control Box is a purpose build item which interfaces to the ATIM-C PCB. This sub-system level assembly is completed and ready for delivery to MWA when required. The following modifications have been incorporated into the design during construction:

- a) The DIN rail part was missing from the original parts list
- b) An extra earth tag was required during assembly
- c) Cable glands were added to better secure the mains cables
- d) This unit is very labour intensive and a redesign should be considered to reduce assembly costs. MWA should review this in the next phase.

3.13 **Cables**

Status: Completed

One complete set of cables are completed and ready for delivery to MWA when required. The following modifications have been incorporated into the design during construction:

- a) A final set of cable drawings is supplied with details of the changes made during assembly to meet the functionality of the prototype build. See attached documentation

Section 4. As Built Drawings

4.1 Electronic Files

The following is a list of the electronic drawing files covering the modifications to the prototype receiver build to provide an “As built” status of the delivered equipment which can be found in the supplied “Zip” file called “As Built.zip”:

- a) MWAM002C AC Enclosure Sheet metal.PDF
- b) MWAM009A Main enclosure foam at cable end.PDF
- c) MWAM013C Flow splitter.PDF
- d) MWAM015A Main enclosure foam above duct.PDF
- e) MWAM016A Main enclosure foam at side top.PDF
- f) MWAM018A Ac enclosure foam top side.PDF
- g) MWAM032C PSU front panel.PDF
- h) MWAM039C SBC Enclosure.PDF
- i) MWAM042A Lid Stiffening.PDF
- j) MWAM047A Flat Connector panel.PDF

Section 5. Assembly Procedures

5.1 Electronic Files

The following is a list of the electronic assembly files covering the prototype receiver assembly and cabling to provide an “As built” status of the delivered equipment which can be found in the supplied “Zip” file called “Assembly Procedures.zip”:

- a) SBC Module Build Instruction Prototype.pdf
- b) Enclosure Foam Installation Order.pdf
- c) Cable Assembly Procedures:
 - 1. MWACAB-0001-plusDS.pdf
 - 2. MWACAB-0002-opt-plusDS.pdf
 - 3. MWACAB-0003-plusDS.pdf
 - 4. MWACAB-0004-plusDS.pdf
 - 5. MWACAB-0007-plusDS.pdf
 - 6. MWACAB-0008-plusDS.pdf
 - 7. MWACAB-0009-plusDS.pdf
 - 8. MWACAB-0010-plusDS.pdf
 - 9. MWACAB-0011-plusDS.pdf
 - 10. MWACAB-0013-plusDS.pdf
 - 11. MWACAB-0014-plusDS.pdf
 - 12. MWACAB-0015-plusDS.pdf
 - 13. MWACAB-0016-plusDS.pdf
 - 14. MWACAB-0017-plusDS.pdf
 - 15. MWACAB-0018 DS-Ver.pdf
 - 16. MWACAB-0019-plusDS.pdf
 - 17. MWACAB-0021-B-plusDS.pdf
 - 18. MWACAB-0022-plusDS.pdf
 - 19. MWACAB-0023-plusDS.pdf
 - 20. MWACAB-0024-plusDS.pdf
 - 21. MWACAB-0025-plusDS.pdf
 - 22. MWACAB-0026-plusDS.pdf
 - 23. MWACAB-0027-plusDS.pdf
 - 24. MWACAB-0028-plusDS.pdf
 - 25. MWACAB-0031-plusDS.pdf
 - 26. MWACAB-0032-plusDS.pdf
 - 27. MWACAB-0033-plusDS.pdf
 - 28. MWACAB-0034-plusDS.pdf
 - 29. MWACAB-0035-plusDS.pdf
 - 30. MWACAB-0036-plusDS.pdf
 - 31. MWACAB-0037-plusDS.pdf
 - 32. MWACAB-0038 RevB-plusDS.pdf
 - 33. MWACAB-0039-plusDS.pdf
 - 34. MWACAB-0040-plusDS.pdf
 - 35. MWACAB-0041-plusDS.pdf
 - 36. MWACAB-0052-plusDS.pdf
 - 37. MWACAB-0053-plusDS.pdf
 - 38. MWACAB-0054-plusDS.pdf

Section 6. Surplus Materials

6.1 Surplus Materials List

A surplus materials list will be provided on request on the acceptance and completion of this phase of the project. A provisional list can be created but if extra work requires the use of these parts it will not be accurate.

Section 7. Revision History

Version	Date	Name	Description
0.1	26/07/10	Derek Carroll	First Draft
1.0	28/07/10	Derek Carroll	Release Version