



Atacama Large Millimeter Array

Back End Documentation Procedures

BEND-50.00.00.00-068-C-PRO

Version: C
Status: Released

2006-10-10

Prepared By:		
Name(s) and Signature(s)	Organization	Date
C. Janes S. Smith	NRAO	2006-10-10
Approved By:		
Name and Signature	Organization	Date
Clint Janes	NRAO	
Fabio Biancat Marchet	ESO	



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 2 of 23

Change Record

Version	Date	Affected Section(s)	Change Request #	Reason/Initiation/Remarks
B	2005-07-29	all	N/A	Rewrite to comply with revised project requirements
C	2006-10-10			Extensive revision showing changes in procedures since 2005-12-12. Included are reorganization and expansion of document review procedures, description of CIDL, and procedure for archiving source files on EDM.



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 3 of 23

Table of Contents

1	DESCRIPTION	5
1.1	Purpose	5
1.2	Scope	5
2	RELATED DOCUMENTS AND DRAWINGS.....	5
2.1	Applicable Documents	5
2.2	Reference Documents.....	6
3	ABBREVIATIONS AND ACRONYMS	6
4	GLOSSARY.....	7
5	RESPONSIBILITY OF EDM USERS IN THE BE IPT	9
5.1	BE IPT Leads.....	9
5.2	BE Documentation Specialist.....	9
5.3	Authors	9
5.4	Reviewers	9
6	DOCUMENT TYPES IN BE EDM LOCATIONS	10
6.1	Documents in <i>DRR</i>	10
6.1.1	Internal ICDs.....	10
6.1.2	Manufacturing documents	10
6.1.3	Configuration Item Data List (CIDL).....	11
6.1.4	Configuration Item Document Index [RD 01].....	12
6.1.5	Internal Change Orders (ICOs).....	12
6.2	Documents in <i>Approved forum</i>	12
6.3	Documents in <i>Released forum</i>	12
6.4	Documents in <i>DOCUMENTATION Workspace</i>	13
6.5	Documents in <i>Meetings – Back End</i>	13
6.6	Documents in <i>Test Data and Test Plans – Back End</i>	13
7	<i>DRR</i> REVIEW PROCEDURE.....	13
7.1	Entry of Documents.....	13
7.2	Review of Documents	14
7.3	Approval of Documents.....	14
7.4	Withdrawal of Documents.....	15
8	ALMA MEMOS SUBMISSION PROCEDURE	15
9	PROCEDURE FOR SUBMISSION TO <i>DOCUMENTATION WORKSPACE</i>	15
10	ASSIGNING A NUMBER TO BE DRAWINGS AND DOCUMENTS	16
10.1	EDM Document Number Generator	16
10.2	Use of CIN and revision letters	16
10.3	Use of suffixes.....	16
10.4	Use of Drawing Size Codes	16
10.5	File Names.....	17
11	TEMPLATES FOR BE DOCUMENTS.....	17
12	CHANGES AND REVISIONS TO BEND DOCUMENTS	17



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 4 of 23

13	SHOP MANUAL AND BACKUP ARCHIVE (DOCUMENTATION NOT STORED ON EDM)	17
13.1	Definition	17
13.2	Management of Shop Manual	18
13.3	Contents, at a minimum:	18
13.3.1	Test Data.....	18
13.3.2	Correspondence	18
13.3.3	Purchasing Documents	18
13.3.4	Software.....	18
13.3.5	Data Sheets, Application Notes and Similar Literature.....	19
13.3.6	Quality Assurance Build Book	19
	APPENDIX A: EXAMPLE COVER PAGE.....	20
	APPENDIX B: EXAMPLE CIDL.....	22
14	APPENDIX C: DOCUMENTATION REQUIRED PER LRU OR MAJOR SUBASSEMBLY	23



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 5 of 23

1 Description

1.1 Purpose

This document defines documentation procedures for the ALMA Back End IPT as required in [AD 02]. The intent of this document is to comply with the general documentation guidelines as defined in the applicable documents. The project requirements are herein interpreted to meet the specific needs of the BE.

BE documentation shall be sufficient to facilitate understanding, procurement, qualification, maintenance (to include repair), operation, revision, and even duplication of the design at a later date, if necessary.

1.2 Scope

The procedure lists what documentation is required and explains how to prepare, archive, and revise documents and drawings for the Back End design following project requirements insofar as is practicable.

This document supports the premise that all Back End documents required for production and later operation shall be located in a controlled forum.

Revision procedures for released documents are detailed in [AD 01] and [AD 04].

2 Related Documents and Drawings

2.1 Applicable Documents

[AD 01] ALMA Documentation Standards, ALMA-80.02.00.00-003-G-STD

[AD 02] ALMA Documentation Control Plan, ALMA-80.02.00.00-011-D-PLA

[AD 03] ALMA Product Assurance Requirements, ALMA-80.11.00.00-001-C-GEN

[AD 04] Configuration Item and Documentation Numbering, BEND-50.00.00.00-105-B-PLA

[AD 05] Back End IPT Product Assurance Requirements, BEND-50.00.00.00-079-B-PRO

[AD 06] ALMA Reviews Definitions, Guidelines and Procedures, ALMA-80.09.00.00-001-C-PLA

[AD 07] Verification Plan for the Back End Subsystem, BEND-50.00.00.00-113-A-PLA



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 6 of 23

2.2 Reference Documents

[RD 01] Back End Configuration Item Document Index, BEND-50.00.00.00-075-A-LIS

[RD 02] Back End Configuration Item Numbers and Product Tree, BEND-50.00.00.00-084-A-LIS

3 Abbreviations and Acronyms

BE	Back End
BOM	Bill of Materials
CD	Compact Disk
CDR	Critical Design Review
CI	Configuration Item
CIDI	Configuration Item Document Index
CIDL	Configuration Item Data List
CIN	Configuration Item Number
CRE	Change Request
DAR	Document Approval Request
DRR	Document Release Request
EDM	Electronic Data Management
ICD	Interface Control Document
ICO	Internal Change Order
IPS	Integrated Product Schedule
IPT	Integrated Product Team
JAO	Joint ALMA office
LRU	Line Replaceable Unit
MRR	Manufacturing Readiness Review
PA	Product Assurance
PCB	Printed Circuit Board
PDR	Preliminary Design Review
PRR	Pre-Production Preliminary Review
RfW	Request for Waiver
SoW	Statement of Work
SI	Systems Integration



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 7 of 23

4 Glossary

To ease reference for frequent EDM users in BE IPT, this document uses terms that have come into conversational use.

Forums

“Released forum” is here used to describe the EDM folder located at:

- Workspaces
 - >Released Documentation
 - >IPT-Level Documents
 - >Released IPT-Level Documents
 - >50 Back End

“Released ICD forum” is here used to describe the EDM folder for internal ICDs only, which is located at:

- Workspaces
 - >Released Documentation
 - >IPT-Level Documents
 - >Released IPT-Level Interface Control Documents
 - >50 Back End

“DOCUMENTATION workspace” is here used to describe the EDM folder where BE draft documents and those that need not pass through the release process are stored, and which is located at:

- Workspaces
 - >Workspaces for IPTs
 - >50 Back End
 - >DOCUMENTATION – Back End

“DRR” is here used to describe the EDM forum where Back End Document Release Requests are reviewed by the BE IPT, which is located at:

- Workspaces
 - >Workspaces for IPTs
 - >50 Back End
 - >BE Document Release Requests

“Approved forum” is here used to describe the EDM folder that is a subfolder within DRR, and which is located at:

- >BE Document Release Requests
 - >Approved Requests (signed by IPT Leads)



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 8 of 23

“Withdrawn forum” is here used to describe the EDM folder that is a subfolder within DRR, and which is located at:

- >BE Document Release Requests
- >Withdrawn Requests

Document Workflow States

A “Draft” document is one which either is in DRR and is not ready for IPT Lead signatures, or is in DOCUMENTATION and therefore not under review.

An “Approved” document is one which has been electronically signed by both IPT Leads and placed in the Approved forum. This location is solely for the use of BE IPT members. Note: “Approved” refers to the workflow state that appears in the document’s EDM entry and to the fact that it has been signed by both IPT Leads and placed in the Approved forum. The Approved document’s cover page and header will say “Released,” as noted below.

A “Released” document is an Approved document which exists in the “Released forum.” This location is for the use of all EDM users. Note: documents that have been signed by both IPT leads will say “Released” on the cover page and header, though their placement is in both the “Approved” and “Released” forums.

An “Obsolete” document is one which does not describe an LRU currently used in the ALMA Back End.

A “Withdrawn” document is one which has entered DRR and been shown during review to require more revision than is appropriate during the review process.

A “Pending” document is one which has been previously approved and is in the review process for approval with a higher revision letter.

A “Superseded” document is the older version of a document which has been revised after approval and re-approved at a higher revision letter. The document with the higher revision letter is then “Approved” and “Released.”



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 9 of 23

5 Responsibility of EDM users in the BE IPT

5.1 BE IPT Leads

Ultimately, the European BE IPT Lead is responsible for complying with all documentation requirements for European deliverables, and the North American IPT Lead is responsible for complying with all documentation requirements for North American deliverables. Both IPT Leads are responsible for the final approval of each BE document required for production.

5.2 BE Documentation Specialist

The BE Documentation Specialist is responsible for the correct implementation of documentation procedures. This includes but is not limited to the correct numbering, formatting and copyediting of documents, their timely processing when in review, and their placement and archiving. S/he shall track major changes in document status such as revision changes, withdrawal or obsolescence. S/he shall provide documentation support to BE IPT members. S/he shall also communicate with the ALMA Project Documentation Specialist or other support staff to address EDM-specific technical problems that BE personnel cannot or do not have permission to address.

5.3 Authors

The Product Engineer is ultimately responsible for ensuring that the necessary documents associated with his/her configuration item are generated. S/he is frequently, but not always, the document author.

The author is responsible for correctly formatting the document to the best of his/her abilities. S/he shall notify the BE Documentation Specialist when a document is ready for review in DRR. S/he shall reply to all reviewers' comments regarding the document and shall redraft a reviewed document to address relevant issues. The author is also responsible for determining and indicating to the BE Documentation Specialist when a document needs other attention as its status requires.

5.4 Reviewers

The reviewers of a document are invited to check the document's technical accuracy to the best of their knowledge. Reviewers may also point out format or language errors. Each reviewer is asked to post a reply comment indicating any changes deemed necessary, or if none, indicating that the document is acceptable.



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 10 of 23

6 Document Types in BE EDM Locations

This section describes the types of documents that should be archived in each EDM folder. The folders are given in the order that they appear, from top to bottom, at Workspaces >Workspaces for IPTs > 50 Back End.

The 50 Back End workspace contains the following folders, or forums:

BE Document Release Requests
DOCUMENTATION – Back End
MEETINGS – Back End
PURCHASE REQUISITIONS – Back End (*obsolete – no longer in use*)
TEST DATA and Test Plans – Back End

Note: the PURCHASE REQUISITION folder is no longer in use, and so is not described in this document.

For a complete discussion of ALMA document types, see [AD 01 Sec. 4.3.6], Table 4: Document Types.

6.1 Documents in DRR

This forum provides a review process for production and operations documents that will eventually be placed in the Released forum.

The forum is only for documents with numbers starting with BEND and only for documents to be reviewed and released by the BE IPT. Documents with numbers starting with “ALMA” are submitted to the Document Approval Requests forum. [AD 01].

6.1.1 Internal ICDs

An internal ICD is an ICD describing the interface between LRUs and major assemblies within the Back End. Internal ICDs shall be prepared as necessary to ensure that interface requirements are documented.

6.1.2 Manufacturing documents

Documents necessary for the production stage, including internal ICDs, must all be reviewed and approved in DRR. Documents produced during the



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 11 of 23

prototyping stage may be reviewed in DRR, approved and released if they are necessary to understand or reconstruct the production design and plans.

The following subject areas are the basics necessary for each LRU/major subassembly. Where appropriate, the information requirements can be combined into a single document. Likewise, additional documents may be deemed necessary to describe a design.

Commercially procured LRUs / Major Subassemblies

- Statement of work (SOW)
- Specification (SPE)
- Design description including user/troubleshooting manual

In-house LRUs / Major Subassemblies

- Configuration Item Document List (CIDL) (See Section 6.1.3)
- Block diagram
- Bill of materials (BOM)
- Assembly instructions
- Verification and acceptance test plan, procedure and results
- Schematic
- Board layout
- Schematic source files as attachment to CIDL (See Section 6.1.3)
- Gerber files as attachment to CIDL (See Section 6.1.3)
- Detailed firmware description with high-level block diagram
- Firmware source files as attachment to CIDL (See Section 6.1.3)
- Hardware definition document or theory of application

6.1.3 Configuration Item Data List (CIDL)

A CIDL for each LRU shall be submitted to DRR for approval and release. The CIDL shall show a simplified drawing of the LRU to ease identification, and shall list all documents required to manufacture the product. All of the manufacturing files shall be placed in .zip files whenever appropriate (i.e., files generated by Protel DXP or Inventor) and located with the CIDL, as attachments, throughout the review, and will remain there upon approval and release. For instance, when a firmware description is submitted to DRR, that entry will contain only the .doc and .pdf files used to generate the document; all firmware source files will be attached to the CIDL in a clearly named .zip. In



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 12 of 23

this way, the CIDL will act as the “library” for the LRU, naming all related documents and providing a central location for all manufacturing files.

A note on names of .zip files: software conflicts have shown that it can be useful to include the program and version, such as “Inventor 10 Main Assembly.zip”.

For a sample CIDL, see Appendix B.

6.1.4 Configuration Item Document Index [RD 01]

A Configuration Item Document Index, located in DRR, lists all released BE documents, organized in parallel with [RD 02]. By nature, this document will be the last ALMA Back End document to be released. It is located in DRR for easy access.

6.1.5 Internal Change Orders (ICOs)

The template for BE Internal Change Orders is located in:

DOCUMENTATION
> Templates

An ICO is necessary only for documentation regarding LRUs that are in production.

6.2 Documents in *Approved forum*

When a document is approved by both IPT Leads, the entire DRR entry shall be moved to the Approved forum. This provides a history, including reply comments and source files, of the document to facilitate any future revisions.

6.3 Documents in *Released forum*

Approved documents shall be added to the Released forum for access by all EDM users. Only the .pdf of the document will be stored with the entry. When a document becomes obsolete, it will be removed from this forum.

The exception is approved internal ICDs, which shall be added to the Released ICD forum.



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 13 of 23

Only the ALMA and BE Documentation Specialists shall have the permission to load, change, or remove documents from the Released forum.

6.4 Documents in *DOCUMENTATION Workspace*

The DOCUMENTATION workspace forum can be used to archive draft documents of any type, test data, documents for prototypes, meetings minutes, and any other documents that are not necessary for production – that is, not subject to configuration control - and therefore not suited for the DRR review process and subsequent release.

6.5 Documents in *Meetings – Back End*

This forum contains meetings minutes and other relevant documentation.

6.6 Documents in *Test Data and Test Plans – Back End*

Prototype verification test plans and procedures and acceptance test plans and procedures for each LRU shall be stored in DOCUMENTATION – Back End >TEST DATA and Test Plans. (Production test plans and procedures shall be submitted to DRR.) The forum shall not contain test data that belongs in the shop manual, such as data from tests of each serial numbered item.

7 DRR Review Procedure

7.1 Entry of Documents

Documents shall be submitted individually; i.e. separate documents may not exist in EDM as attachments to a primary document. Only the source file(s) may be attachments.

Documents for review in DRR must meet the standards in [AD 01]. This includes the use of the appropriate ALMA template (see Section 13) and a document number reserved in the EDM number generator (see Section 10.1.)

The primary file for all documents (including drawings) shall be in .PDF format. The source files shall be added to the entry as attachments. Although the ALMA requirements specify that all documents are to be submitted in .PDF, non-reviewable drawings and files which are otherwise not practical to convert to .PDF, such as Gerber files, certain firmware listings, and some AutoCAD drawings, shall be listed but with only a cover page in .PDF format. The cover page will use the



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 14 of 23

standard ALMA template, be assigned a document number, and give a brief paragraph redirecting the user to the CIDL to which the source files are attached (see Section 6.1.3.) An example cover page is shown in Appendix A.

Where archiving source files on EDM is not practicable, the responsible Product Engineer will submit the files on CD to the BE Documentation Specialist for separate archiving. Also see Section 13.2.

When a document entry is created on DRR, its status is “Submitted.” The BE Documentation Specialist will review it for correct format. When the document is ready for review, the Documentation Specialist will change the status to “In Technical Review,” at which time EDM will notify reviewers that the document is ready for the next stage in the approval process.

7.2 Review of Documents

A default list of reviewers is assigned by EDM; the author or other submitter may specify additional reviewers, if appropriate. For example, the Safety Officers should be added to the reviewer list for any documents impacting safety. All ALMA personnel are welcome to review and comment on drawings on the BE DRR, whether named as reviewers or not.

Comments about a document can be entered using the “Reply” function. To post a comment addressing the document, press the blue “Reply” button at the top of the entry page. To post a comment addressing another reviewer, press the “Reply” button beside that reviewer’s comment.

After the document’s status is “In Technical Review” for 14 days, EDM automatically changes the status to “In Author Response” and prompts the author to respond to the reviewer comments. When the document is appropriately revised and/or all the comments are responded to, the author shall post a comment indicating their action. The author shall also notify the BE Documentation Specialist whether the document status should return to “In Technical Review” or progress to the approval signature status “To (North American IPT Lead name).”

7.3 Approval of Documents

The IPT leads and BE Documentation Specialist shall ensure that the document author replies reasonably to all comments before document approval.

When the document’s workflow state is “To (North American IPT Lead name)”, this IPT Lead shall indicate approval of the document with an EDM reply comment



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 15 of 23

and electronically sign the .PDF document, then change the workflow state to “To (European IPT Lead).”

The European IPT Lead shall follow the same approval procedure and change the workflow state to “Approved Document.”

The BE Documentation Specialist will then move the entire entry, including reply comment history and source files, to the Approved forum. S/he will then post an entry, which shall contain the .PDF only, to the Released forum.

If the IPT Leads do not approve of the document, they can return the document to the workflow state “In Author Response” or “To Documentation Specialist” and post a reply comment indicating the necessary action.

7.4 Withdrawal of Documents

If, after submission to DRR, a document requires more revision than is appropriate during the review process, the author or IPT Leads can ask the Documentation Specialist to move the entry to the Withdrawn forum and change the workflow state to “Withdrawn.” The author can revise the document and re-submit to DRR at any time. This begins the review process anew.


Note that if during review a document is shown to be unnecessary for production, it is not designated “Withdrawn,” but rather moved to the DOCUMENTATION forum. Its status will remain “Draft.”

8 ALMA Memos Submission Procedure

Drafts of ALMA memos should be submitted directly to the JAO for approval. Because the audience for ALMA memos includes the community outside the immediate project, ALMA memos are edited and evaluated by the JAO office.

9 Procedure for Submission to *DOCUMENTATION Workspace*

Authors are free to submit documents to the IPT workspace without review, and to revise them without approval. The use of a template and document number as early in the drafting process as possible is encouraged.

	<p>Back End Documentation Procedures</p>	<p>Doc # : BEND-50.00.00.00-068-C-PRO Date: 2006-10-10 Status: Released Page: 16 of 23</p>
--	---	---

10 Assigning a Number to BE Drawings and Documents

10.1 EDM Document Number Generator

All numbers shall be assigned using the EDM automatic document number generator. This number generator keeps track of the CIN and document sequence number that correspond to the title of the document. If a document number is assigned without using the document number generator, document sequence numbers cannot be tracked, and a different document may later be assigned the same number.

To assign a number, click on the link “Doc Numbers” the top right corner of the EDM display page. Under “Reserve a Number,” choose “Find next available document number” or “Find next available ICD number” as appropriate. From this point the number generator will provide a step-by-step procedure.

Numbers for documents that pertain to the Back End alone and do not require JAO approval will start with BEND. Numbers for documents requiring project-wide approval (e.g., external ICDs) start with ALMA. Document suffixes allowed by the EDM document number generator are listed in **[AD 01]**.

10.2 Use of CIN and revision letters

Use of CIN and revision letters shall comply with **[AD 04]**.

10.3 Use of suffixes


Only the suffixes listed in **[AD 01]** are allowed by the number generator.

As a result, most design drawings such as mechanical drawings, assembly drawings, schematics, block diagrams, illustrations, etc., end in DWG. To compensate, include the drawing type in the title block.

10.4 Use of Drawing Size Codes

See **[AD 01]** for a complete discussion of standard drawing sizes.

Drawing sizes, such as A, B, C, etc., may be shown on mechanical drawings for reference, especially for scale drawings; however, printout sizes are typically constrained by the printer used. As such, the drawing size is not included in the document number.

	<p>Back End Documentation Procedures</p>	<p>Doc # : BEND-50.00.00.00-068-C-PRO Date: 2006-10-10 Status: Released Page: 17 of 23</p>
--	---	---

10.5 File Names

The file name for documents submitted to EDM shall use the following format: yyyy-mm-dd-*document number* where yyyy-mm-dd is the ISO current date; for example, 2005-03-09-BEND-50.00.00.00-068-B-PRO. The current date is used to differentiate between draft document revisions, such as those that take place while a document is in DRR. The revision letter is to be changed only when an approved document is revised.

The file name of the .pdf and the source file shall be the same. The exception is the .zip attachment, which when necessary shall have a reasonably descriptive name.

11 Templates for BE Documents

Templates which meet ALMA and BE standards can be found in the DOCUMENTATION workspace, in the subfolder “Templates.”

It is recognized that no one title block is suitable for all drawings. The title block of each drawing shall preferably appear in the lower right corner, and shall contain the ALMA logo and a signature space for each IPT Lead. Each drawing must also contain a change record. Drawing title block templates that may be used as they are or as examples are located in the DOCUMENTATION workspace in “Templates.”

The required content of the document, including related documents references, the document status, the header information, lists and tables, the change record, and lists of applicable documents is outlined in [AD 01] and is accommodated by the templates in the DOCUMENTATION workspace.

12 Changes and Revisions to BEND Documents

The procedure for changes and revisions to BEND documents is given in [AD 04].

13 Shop Manual and Backup Archive (Documentation not stored on EDM)

13.1 Definition

The shop manual shall serve as a hardcopy archive for all documents required to be in the BE released document forum and as a depository for all other documentation



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 18 of 23

that is not suitable or necessary for EDM, but that would be useful after the project construction phase is complete.

13.2 Management of Shop Manual

The Product Engineer is responsible for maintaining a shop manual for each BE LRU and major sub-assembly type under his/her purview. A loose leaf binder(s) is adequate and shall be clearly marked "Shop Manual for [LRU or assembly name and CIN]." Locking metal rings are recommended for the manual. The manual shall be maintained with up-to-date documentation by the design group responsible until the end of the construction project. At that time, the manual shall be transferred from the BE IPT to whatever entity the responsible Executive assigns to provide follow-on support to ALMA maintenance.

The Product Engineer shall send a duplicate of the manual with the 1st product delivery to Chile. Responsibility for maintenance of the manual after delivery to Chile shall transfer from the BE IPT to whomever JAO shall direct.

Shop manuals will not be assigned a document number.

13.3 Contents, at a minimum:

13.3.1 Test Data

The shop manual will serve as a repository for the volumes of test data that would overload and confuse the Released forum; for example, data from tests of individual components.

13.3.2 Correspondence

The shop manual will serve as a repository for correspondence, notes, and worksheets not suitable for the Released forum.

13.3.3 Purchasing Documents

Copies of purchasing documents shall be saved for future reference.

13.3.4 Software

Application software media and source code for executables used for the project where permitted by licensing agreements, and where not otherwise



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 19 of 23

required by project documentation requirements, shall be contained in the shop manual.

13.3.5 Data Sheets, Application Notes and Similar Literature

Copies of data sheets, application notes, instruction manuals, and other vendor literature too bulky for inclusion on EDM and where copyright restrictions may prohibit scanning shall be contained in the shop manual.

13.3.6 Quality Assurance Build Book

A Build Book shall accompany each serial number. The Quality Assurance Manager shall include in the Shop Manual:

- Vendor compliance statements for a serial numbered part used in that specific LRU.
- CIDL.
- Assembly Instructions (sometimes called a “Traveler”): a document to track fabrication, assembly, receipt of parts, and testing (see [AD 05]).
- Acceptance test results specific to the serial number.
- Other quality assurance documents deemed necessary.



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 20 of 23

Appendix A: Example Cover Page



**Atacama
Large
Millimeter
Array**

ALMA Back End

Second LO Synthesizer (LO2)

Monitor and Control
Printed Circuit Board


BEND-55.05.01.01-001-A-DWG

Version: A


Status: Released

2005-07-28

Prepared By:		
Name(s) and Signature(s)	Organization	Date
R. Scott	NRAO Socorro	2005/07/28
Approved By:		
Name and Signature	Organization	Date
Alain Baudry <small>Signature numérique de Alain Baudry DN : cn=Alain Baudry, o=FR, ou=OASU, ou=LAB Date : 2005.09.29 11:09:00 +02'00'</small>		
Clint Janes <small>Digitally signed by Clint Janes DN: CN = Clint Janes, C = US, O = NRAO, OU = ALMA SE IPF Date: 2006.09.29 12:09:20 - 06'00'</small>		
Released By:		
Name and Signature	Organization	Date

	Back End Documentation Procedures	Doc # : BEND-50.00.00.00-068-C-PRO Date: 2006-10-10 Status: Released Page: 21 of 23
--	--	--

(change record not shown)

	ALMA Back End, Second LO Synthesizer, Monitor and Control Printed Circuit Board	Doc # : BEND-55.05.01.01-001-A-DWG Date: 2005-07-28 Status: Released Page: 3 of 3
---	---	--

It is not useful to create portable document format (.pdf) versions of a printed circuit board.

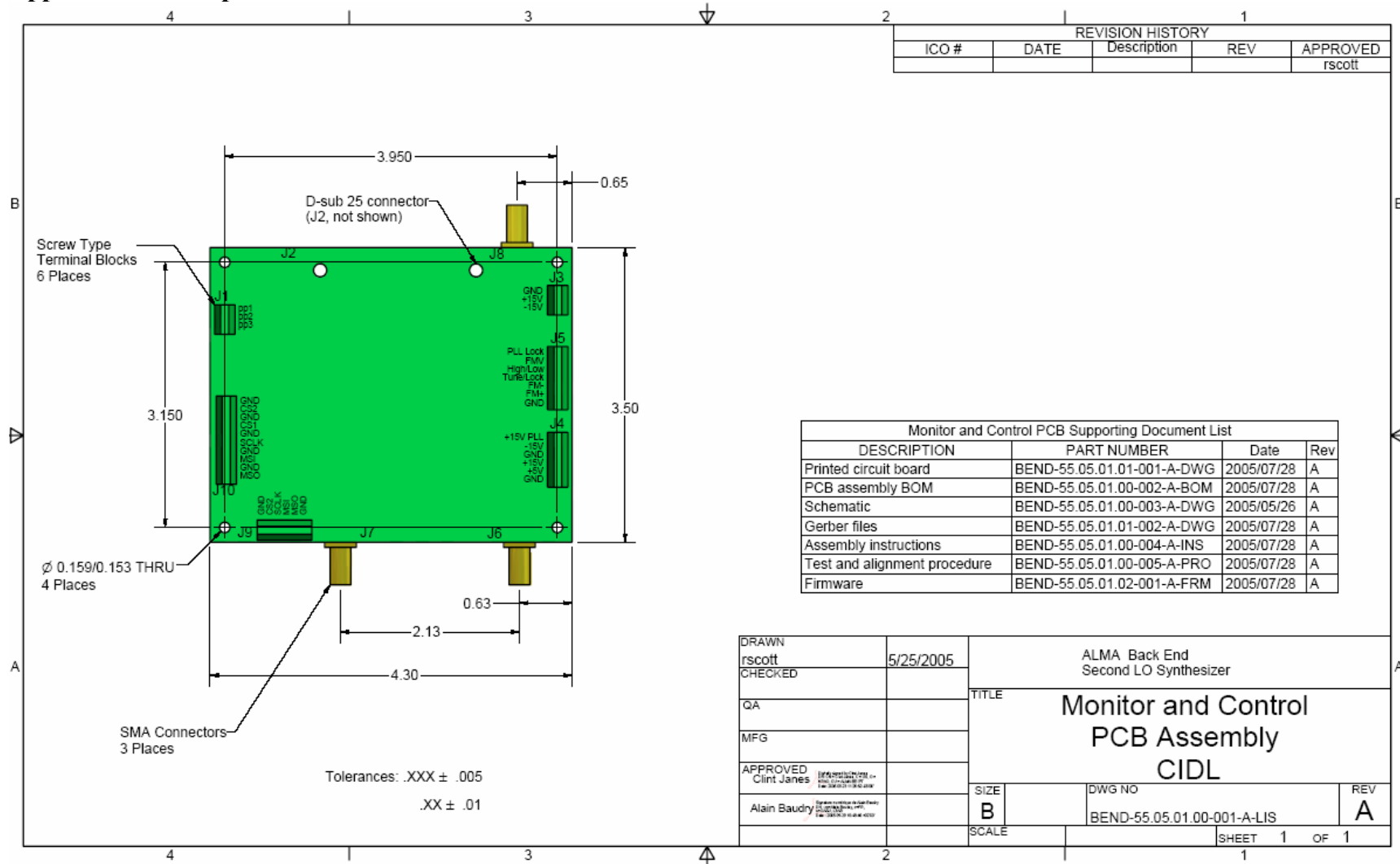
This file is intended to inform the user that the printed circuit board is defined by the schematic and Gerber files which exist as multiple files within Protel DXP. All the files required to document this printed circuit board may be found in one archived (zipped) electronic attachment to the document, Monitor and Control PCB Assembly Drawing List and Outline Drawing (BEND-55.05.01.00-001-A-LIS).



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
 Date: 2006-10-10
 Status: Released
 Page: 22 of 23

Appendix B: Example CIDL



REVISION HISTORY				
ICO #	DATE	Description	REV	APPROVED
				rscott

Monitor and Control PCB Supporting Document List			
DESCRIPTION	PART NUMBER	Date	Rev
Printed circuit board	BEND-55.05.01.01-001-A-DWG	2005/07/28	A
PCB assembly BOM	BEND-55.05.01.00-002-A-BOM	2005/07/28	A
Schematic	BEND-55.05.01.00-003-A-DWG	2005/05/26	A
Gerber files	BEND-55.05.01.01-002-A-DWG	2005/07/28	A
Assembly instructions	BEND-55.05.01.00-004-A-INS	2005/07/28	A
Test and alignment procedure	BEND-55.05.01.00-005-A-PRO	2005/07/28	A
Firmware	BEND-55.05.01.02-001-A-FRM	2005/07/28	A

DRAWN rscott	5/25/2005	ALMA Back End Second LO Synthesizer	
CHECKED		TITLE Monitor and Control PCB Assembly CIDL	
QA		SIZE B	DWG NO BEND-55.05.01.00-001-A-LIS
MFG		SCALE	REV A
APPROVED Clint Jones		SHEET 1 OF 1	
Alain Baudry			

Tolerances: .XXX ± .005
 .XX ± .01



**Back End
Documentation Procedures**

Doc # : BEND-50.00.00.00-068-C-PRO
Date: 2006-10-10
Status: Released
Page: 23 of 23

14 Appendix C: Documentation Required per LRU or major subassembly

A detailed description of each item listed below is given in [AD 03].

The Product Engineer is responsible for the production of documentation for each LRU or major subassembly under his/her purview.

- CIDL
- Internal ICD
- External ICD
- Verification Test Plan, procedure, test report, compliance matrix
- Acceptance Test Plan, procedures, test report
- Shipping, handling, and storage: product specific
- Safety concerns, procedures specific to product
- RfWs, if any
- CRes, if any
- Block diagrams
- Schematics
- Layout drawings (for modules)
- Layout drawings (for circuit boards)
- Mechanical drawings (module specific panels, brackets, etc)
- Mechanical drawings (exploded assembly drawing: presentation)
- Mechanical drawings (weight, form factor)
- AC power requirements (if any)
- BOM (w/spare parts annotated, MTBF, and obsolescence strategy)
- Wire lists
- Cable assembly drawings
- Assembly instructions (traveler)
- Theory of Operation, timing diagrams, state diagrams, as appropriate
- Troubleshooting guide, Failure effects analysis
- Test set instructions (connecting, software, operation)
- Alignment, scheduled maintenance guide and schedule
- Firmware, microprocessor software description, listing
- Recommended training, skill level for testing and for repair
- Shop Manual (for QA, travelers, other)
- Fault Record (if available; eg, BE Helpdesk record)