

WBS Dictionary as of Mon 10/21/02
CDF Run 2B Data Acquisition and Trigger Upgrade

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level																									
1.3	Run 2b DAQ and Trigger Project	\$4,048,791.00	\$3,951,743.00	\$97,048.00	0	0	0																									
	<u>Notes</u>																															
	WBS Description:																															
	Project includes TDC upgrade, XFT upgrade, L2 upgrade, SVT upgrade, EVB upgrade and L3 PC replacements.																															
1.3.1	Run 2b TDC Project	\$1,183,030.00	\$1,085,982.00	\$97,048.00	0	0	0																									
	<u>Notes</u>																															
	WBS Description:																															
	This summary element covers the development and construction of new time to digital converters (TDC) used in the readout of the CDF central outer tracker (COT).																															
1.3.1.1	Start Run 2b TDC Subproject	\$0.00	\$0.00	\$0.00	0	0	3																									
	<u>Notes</u>																															
	WBS Description:																															
	Milestone - denoting the start of the Run 2b TDC level 3 subproject																															
1.3.1.2	Specification & Development	\$50,840.00	\$44,240.00	\$6,600.00	0	0	0																									
	<u>Notes</u>																															
	WBS Description:																															
	This summary task covers the new TDC's specification and development on hit time digitization, buffer management, front-end ASDQ and trigger interfaces and data compression																															
1.3.1.2.1	Formal Specification	\$1,120.00	\$1,120.00	\$0.00	0	0	0																									
	<u>Notes</u>																															
	WBS Description:																															
	This task covers cost of TDC functionality specifications and their physics justification																															
1.3.1.2.1.1	Block Diagram	\$1,120.00	\$1,120.00	\$0.00	0	0	0																									
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">ID</th> <th style="text-align: left;">Resource Name</th> <th style="text-align: right;">Units</th> <th style="text-align: right;">Work</th> <th style="text-align: left;">Delay</th> <th style="text-align: left;">Start</th> <th style="text-align: left;">Finish</th> <th style="text-align: right;">Cost</th> <th style="text-align: right;">Baseline Cost</th> <th style="text-align: right;">Act. Cost</th> <th style="text-align: right;">Rem. Cost</th> </tr> </thead> <tbody> <tr> <td>11</td> <td>INKIND</td> <td style="text-align: right;">1,120</td> <td style="text-align: right;">1,120</td> <td>0 days</td> <td>Mon 6/24/02</td> <td>Mon 6/24/02</td> <td style="text-align: right;">\$1,120.00</td> <td style="text-align: right;">\$0.00</td> <td style="text-align: right;">\$1,120.00</td> <td style="text-align: right;">\$0.00</td> </tr> </tbody> </table>										ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	11	INKIND	1,120	1,120	0 days	Mon 6/24/02	Mon 6/24/02	\$1,120.00	\$0.00	\$1,120.00	\$0.00
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost																						
11	INKIND	1,120	1,120	0 days	Mon 6/24/02	Mon 6/24/02	\$1,120.00	\$0.00	\$1,120.00	\$0.00																						
	<u>Notes</u>																															
	WBS Description:																															
	This item covers the TDC functional block diagram design																															

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Block Diagram" continued

Notes

M&S BOE: N/A

Labor BOE:

100% - Chicago Electrical Eng. - 2d (16 hrs)@\$70/hr = \$1120

1.3.1.2.1.2	Physics Justification	\$0.00	\$0.00	\$0.00	0	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	PostDocF	100%	160 hrs	0 days	Thu 7/11/02	Wed 8/7/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers physics justification for the design from Run IIa experience and Run IIb luminosity conditions

M&S BOE: N/A

Labor BOE:

This is the time spent on the task

1.3.1.2.2	Interface Specification	\$17,800.00	\$11,200.00	\$6,600.00	0	0	0
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Notes

WBS Description:

This summary task covers cost of the specification for the interfaces to COT ASDQ, XFT and other DAQ components

1.3.1.2.2.1	Trigger	\$6,600.00	\$0.00	\$6,600.00	0	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	240 hrs	0 days	Mon 9/30/02	Fri 11/8/02	\$0.00	\$0.00	\$0.00	\$0.00
4	ElecEngF	50%	120 hrs	0 days	Mon 9/30/02	Fri 11/8/02	\$6,600.00	\$0.00	\$0.00	\$6,600.00

Notes

WBS Description:

This item covers inferace specification to Level 1 XFT

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Trigger" continued

Notes
M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including CDF Run 2a TDC, trigger and calorimeter systems

1.3.1.2.2.2	ASDQ	\$0.00	\$0.00	\$0.00	0	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	120 hrs	0 days	Mon 9/30/02	Fri 10/18/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

This item covers interface specification to the COT front-end ASDQ

M&S BOE: N/A

Labor BOE:

Labor estimated base upon recent experience with system of similar scope, including CDF Run 2a TDC, trigger and calorimeter systems

1.3.1.2.2.3	Crate - Hardware	\$0.00	\$0.00	\$0.00	0	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	120 hrs	0 days	Mon 10/21/02	Fri 11/8/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

This item covers interface specification to VME crate

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope including CDF Run 2a TDC, trigger and calorimeter systems

1.3.1.2.2.4	Data Transmission (FNAL)	\$11,200.00	\$11,200.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDPASSL	11,200	11,200	0 days	Mon 9/30/02	Tue 11/26/02	\$11,200.00	\$0.00	\$0.00	\$11,200.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Data Transmission (FNAL)" continued

Notes

WBS Description:

This item covers the interface specification for the TDC to VME data transmission
The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% - Chicago Electrical Eng. - 8wks (160 hrs)@\$70/hr = \$11200

1.3.1.2.2.5	Data Transmission (Chicago)	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Mon 9/30/02	Tue 11/26/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers the interface specification for the TDC to VME data transmission. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% - Chicago Electrical Eng. - 8w (160 hrs)@\$70/hr = \$11200

1.3.1.2.3	Front End Timing (FNAL)	\$17,920.00	\$17,920.00	\$0.00	0	0	0
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Notes

WBS Description:

This summary task covers the hit time window digitization and programmability

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.1.2.3.1	Simulation	\$6,720.00	\$6,720.00	\$0.00	1	1	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	6,720	6,720	0 days	Thu 8/8/02	Thu 10/31/02	\$6,720.00	\$0.00	\$3,360.00	\$3,360.00

Notes

WBS Description:

This item covers the FPGA and board level simulation, as well as the timing interfaces to the COT front end and the CDF trigger and data acquisition system. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

20% - Chicago Electrical Eng. - 12w (96 hrs)@\$70/hr = \$6720

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.1.2.3.2	Test Board	\$11,200.00	\$11,200.00	\$0.00	1	1	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	50%	160 hrs	0 days	Fri 11/1/02	Fri 1/3/03	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	11,200	11,200	0 days	Fri 11/1/02	Fri 1/3/03	\$11,200.00	\$0.00	\$0.00	\$11,200.00

Notes

WBS Description:

This item covers the cost of building a test board. This is a small board containing an FPGA and some I/O components to test and evaluate the characteristics of the Altera Stratix FPGA. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Altera chip quotation at \$1035 from Arrow Electronics. Remaining aspects of board are physicist's estimate.

Labor BOE:

Labor estimated based upon recent experience with test boards of similar scope developed for the Run 2a trigger system.

50% - Chicago Electrical Eng. - 8w (160 hrs)@\$70/hr = \$11200

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.2.4	Front End Timing (Chicago)	\$0.00	\$0.00	\$0.00	0	0	0

Notes
WBS Description:

This summary task covers the hit time window digitization and programmability

1.3.1.2.4.1	Simulation	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Thu 8/8/02	Thu 10/31/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

This item covers the FPGA and board level simulation, as well as the timing interfaces to the COT front end and the CDF trigger and data acquisition system. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

20% - Chicago Electrical Eng. - 12w (96 hrs)@\$70/hr = \$6720

1.3.1.2.4.2	Test Board	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Fri 11/1/02	Fri 1/3/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

This item covers the cost of building a test board. This is a small board containing an FPGA and some I/O components to test and evaluate the characteristics of the Altera Stratix FPGA. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Altera chip quotation at \$1035 from Arrow Electronics. Remaining aspects of board are physicist's estimate.

Labor BOE:

Labor estimated based upon recent experience with test boards of similar scope developed for the Run 2a trigger system.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Test Board" continued

Notes

50% - Chicago Electrical Eng. - 8w (160 hrs)@\$70/hr = \$11200

1.3.1.2.5	Buffer Management (FNAL)	\$4,200.00	\$4,200.00	\$0.00	0	0	0
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Notes

WBS Description:

This summary task covers the design of TDC buffer management to meet the CDF DAQ protocol

1.3.1.2.5.1	Simulation	\$0.00	\$0.00	\$0.00	0	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	0	0	0 days	Thu 8/8/02	Thu 8/8/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers the cost of simulation for buffer management. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

20% - Chicago Electrical Eng. - 4w (32 hrs)@\$70/hr = \$2240

1.3.1.2.5.2	Trial Implementation	\$4,200.00	\$4,200.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	PostDocF	50%	60 hrs	0 days	Fri 9/6/02	Thu 9/26/02	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	4,200	4,200	11.25 days	Mon 9/23/02	Thu 9/26/02	\$4,200.00	\$0.00	\$0.00	\$4,200.00

Notes

WBS Description:

This item covers the cost of a trial implementation of the buffer management design. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Trial Implementation" continued

Notes

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% - Chicago Electrical Eng. - 3w (60 hrs)@\$70/hr = \$4200

1.3.1.2.6	Buffer Management (Chicago)	\$2,240.00	\$2,240.00	\$0.00	0	0	0
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Notes

WBS Description:

This summary task covers the design of TDC buffer management to meet the CDF DAQ protocol

1.3.1.2.6.1	Simulation	\$2,240.00	\$2,240.00	\$0.00	0	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	2,240	2,240	0 days	Thu 8/8/02	Thu 9/5/02	\$2,240.00	\$0.00	\$2,240.00	\$0.00

Notes

WBS Description:

This item covers the cost of simulation for buffer management. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

20% - Chicago Electrical Eng. - 4w (32 hrs)@\$70/hr = \$2240

1.3.1.2.6.2	Trial Implementation	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Fri 9/6/02	Thu 9/26/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers the cost of a trial implementation of the buffer management design. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Trial Implementation" continued

Notes

resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% - Chicago Electrical Eng. - 3w (60 hrs)@\$70/hr = \$4200

1.3.1.2.7	VME Interface (FNAL)	\$4,200.00	\$4,200.00	\$0.00	0	0	0
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Notes

WBS Description:

This summary task covers the design of the TDC chip to VME interface and other related issues

1.3.1.2.7.1	Trial Implementation	\$4,200.00	\$4,200.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	PostDocF	50%	60 hrs	0 days	Wed 11/27/02	Tue 12/17/02	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	4,200	4,200	0 days	Wed 11/27/02	Tue 12/17/02	\$4,200.00	\$0.00	\$0.00	\$4,200.00

Notes

WBS Description:

This item covers the cost of the trial implementation of the TDC to VME interface. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% - Chicago Electrical Eng. - 3w (60 hrs)@\$70/hr = \$4200

1.3.1.2.8	VME Interface (Chicago)	\$1,680.00	\$1,680.00	\$0.00	0	0	0
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Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"VME Interface (Chicago)" continued

Notes

This summary task covers the design of the TDC chip to VME interface and other related issues

1.3.1.2.8.1	Simulation	\$1,680.00	\$1,680.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	1,680	1,680	0 days	Fri 9/6/02	Thu 9/26/02	\$1,680.00	\$0.00	\$1,260.00	\$420.00

Notes

WBS Description:

This item covers the cost of the simulation for the TDC chip to VME interface. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

20% - Chicago Electrical Eng. - 3w (24 hrs)@\$70/hr = \$1680

1.3.1.2.8.2	Trial Implementation	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Wed 11/27/02	Tue 12/17/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers the cost of the trial implementation of the TDC to VME interface. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% - Chicago Electrical Eng. - 3w (60 hrs)@\$70/hr = \$4200

WBS	Name				Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.2.9	Design Review				\$1,680.00	\$1,680.00	\$0.00	0	1	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,680	1,680	0 days	Mon 1/6/03	Wed 1/8/03	\$1,680.00	\$0.00	\$0.00	\$1,680.00

Notes

WBS Description:

The TDC design review task is a milestone.

Note: A successful review on the "Specification & Development" means we are ready to proceed to the "Detailed Design" stage.

M&S BOE: N/A

Labor BOE :

Cost of an engineer attending the review

100% Chicago Electrical Eng. - 3 days (24 hrs) @\$70/hr = \$1680

1.3.1.3	Detailed Design (FNAL)				\$126,060.00	\$98,560.00	\$27,500.00	0	0	0
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Notes

WBS Description:

This summary tasks covers the detailed design for the specifications developed previously.

1.3.1.3.1	Front End				\$11,200.00	\$11,200.00	\$0.00	1	1	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	11,200	11,200	0 days	Thu 1/9/03	Thu 2/6/03	\$11,200.00	\$0.00	\$0.00	\$11,200.00

Notes

WBS Description:

This task covers the cost of the detailed design for the time window digitization. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 4 wks (160 hrs) @\$70/hr = \$11200

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.1.3.2	Trigger Interface	\$11,200.00	\$11,200.00	\$0.00	1	1	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	11,200	11,200	0 days	Fri 2/7/03	Thu 3/6/03	\$11,200.00	\$0.00	\$0.00	\$11,200.00

Notes

WBS Description:

Detailed design of the interface to the XFT Trigger. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 4 wks (160 hrs) @\$70/hr = \$11200

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.1.3.3	Compression	\$8,400.00	\$8,400.00	\$0.00	1	1	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	8,400	8,400	0 days	Fri 3/7/03	Thu 3/27/03	\$8,400.00	\$0.00	\$0.00	\$8,400.00

Notes

WBS Description:

Detailed Design of the on board data format compression design. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 3 wks (120 hrs) @\$70/hr = \$8400

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.1.3.4	Buffers	\$8,400.00	\$8,400.00	\$0.00	1	1	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	8,400	8,400	0 days	Fri 3/28/03	Thu 4/17/03	\$8,400.00	\$0.00	\$0.00	\$8,400.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Buffers" continued

Notes

Detailed design of the L1 and L2 buffers on the TDC boards. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 3 wks (120 hrs) @\$70/hr = \$8400

1.3.1.3.5 VME \$5,600.00 \$5,600.00 \$0.00 1 1 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	5,600	5,600	0 days	Fri 4/18/03	Thu 5/1/03	\$5,600.00	\$0.00	\$0.00	\$5,600.00

Notes

WBS Description:

Detailed design for the TDC-VME interfaces. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 2 wks (80 hrs) @\$70/hr = \$5600

1.3.1.3.6 Test Paths \$5,600.00 \$5,600.00 \$0.00 1 1 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	5,600	5,600	0 days	Fri 5/2/03	Thu 5/15/03	\$5,600.00	\$0.00	\$0.00	\$5,600.00

Notes

WBS Description:

This task covers the cost of the board testing paths. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Test Paths" continued

Notes

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 2 wks (80 hrs) @\$70/hr = \$5600

1.3.1.3.7	Board Layout	\$16,800.00	\$16,800.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	16,800	16,800	0 days	Fri 5/16/03	Fri 6/27/03	\$16,800.00	\$0.00	\$0.00	\$16,800.00

Notes

WBS Description:

This task describes the TDC board layout design. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 6 wks (240 hrs) @\$70/hr = \$16800

1.3.1.3.8	Board Simulation	\$16,800.00	\$16,800.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	16,800	16,800	0 days	Mon 6/30/03	Mon 8/11/03	\$16,800.00	\$0.00	\$0.00	\$16,800.00

Notes

WBS Description:

This task covers the simulation tests of the board layout and functions. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 6 wks (240 hrs) @\$70/hr = \$16800

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.1.3.9	Documentation	\$14,000.00	\$14,000.00	\$0.00	1	1	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	14,000	14,000	0 days	Tue 8/12/03	Tue 9/16/03	\$14,000.00	\$0.00	\$0.00	\$14,000.00

Notes

WBS Description:

This task covers the cost for the documentation of the detailed design. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 5 wks (200 hrs) @\$70/hr = \$14000

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.1.3.10	Firmware development	\$27,500.00	\$0.00	\$27,500.00	1	1	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	50%	500 hrs	0 days	Tue 1/21/03	Wed 7/16/03	\$27,500.00	\$0.00	\$0.00	\$27,500.00

Notes

WBS Description:

This task covers the cost for firmware development for FPGA functions

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.1.3.11	Design Review	\$560.00	\$560.00	\$0.00	1	1	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	560	560	0 days	Wed 9/17/03	Wed 9/17/03	\$560.00	\$0.00	\$0.00	\$560.00

Notes

WBS Description:

This milestone is a design review is for the detailed design of the TDC boards. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

Note: A successful review on the "Detailed Design" means that we are ready to proceed to the prototyping phase.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Design Review" continued

Notes
M&S BOE: N/A

Labor BOE:

One day of engineer labor cost for the review meeting

100% Chicago Electrical Eng. - 1 day (8 hrs) @\$70/hr = \$560

1.3.1.4	Detailed Design (Chicago)	\$0.00	\$0.00	\$0.00	0	0	0
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Notes
WBS Description:

This summary tasks covers the detailed design for the specifications developed previously.

1.3.1.4.1	Front End	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Thu 1/9/03	Thu 2/6/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

This task covers the cost of the detailed design for the time window digitization. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 4 wks (160 hrs) @\$70/hr = \$11200

1.3.1.4.2	Trigger Interface	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Fri 2/7/03	Thu 3/6/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

Detailed design of the interface to the XFT Trigger. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Trigger Interface" continued

Notes

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 4 wks (160 hrs) @\$70/hr = \$11200

1.3.1.4.3	Compression	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Fri 3/7/03	Thu 3/27/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Detailed Design of the on board data format compression design. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 3 wks (120 hrs) @\$70/hr = \$8400

1.3.1.4.4	Buffers	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Fri 3/28/03	Thu 4/17/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Detailed design of the L1 and L2 buffers on the TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Buffers" continued

Notes

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 3 wks (8400 hrs) @\$70/hr = \$8400

1.3.1.4.5	VME	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Fri 4/18/03	Thu 5/1/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Detailed design for the TDC-VME interfaces. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 2 wks (80 hrs) @\$70/hr = \$5600

1.3.1.4.6	Test Paths	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Fri 5/2/03	Thu 5/15/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task covers the cost of the board testing paths. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 3 wks (80 hrs) @\$70/hr = \$5600

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Test Paths" continued

Notes

1.3.1.4.7 Board Layout \$0.00 \$0.00 \$0.00 1 1 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Fri 5/16/03	Fri 6/27/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task describes the TDC board layout design. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 6wks (240 hrs) @\$70/hr = \$16800

1.3.1.4.8 Board Simulation \$0.00 \$0.00 \$0.00 1 1 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Mon 6/30/03	Mon 8/11/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task covers the simulation tests of the board layout and functions. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 6 wks (240 hrs) @\$70/hr = \$16800

WBS	Name					Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.4.9	Documentation					\$0.00	\$0.00	\$0.00	1	1	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
11	INKIND	0	0	0 days	Tue 8/12/03	Tue 9/16/03	\$0.00	\$0.00	\$0.00	\$0.00	

Notes

WBS Description:

This task covers the cost for the documentation of the detailed design. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 5 wks (200 hrs) @\$70/hr = \$14000

WBS	Name					Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.4.10	Design Review					\$0.00	\$0.00	\$0.00	1	1	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	
11	INKIND	0	0	0 days	Wed 9/17/03	Wed 9/17/03	\$0.00	\$0.00	\$0.00	\$0.00	

Notes

WBS Description:

This milestone is a design review is for the detailed design of the TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

Note: A successful review on the "Detailed Design" means that we are ready to proceed to the prototyping phase.

M&S BOE: N/A

Labor BOE:

One day of engineer labor cost for the review meeting

100% Chicago Electrical Eng. - 1 day (8 hrs) @\$70/hr = \$560

1.3.1.4.11	TDC Prototype fabrication contingency task					\$0.00	\$0.00	\$0.00	0	0	0
1.3.1.5	TDC Design Review					\$0.00	\$0.00	\$0.00	0	0	3

Notes

WBS Description:

milestone on TDC Design Review . The TDC's have been sucessfully designed and prototype board fabrication can begin.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.1.6	Prototype - V1.0 (FNAL)	\$143,265.00	\$143,265.00	\$0.00	0	0	0

Notes

WBS Description:

This summary task covers the first round of TDC prototypes including building the boards, debugging and evaluating their performance.

1.3.1.6.1	ASDQ test stand	\$35,000.00	\$35,000.00	\$0.00	0.5	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish
9	MANDS	35,000	35,000	0 days	Thu 10/16/03	Wed 10/29/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	35,000	\$35,000.00	\$0.00	\$0.00	\$35,000.00

Notes

WBS Description:

This task covers the cost for assembling a teststand with VME crate and connecting it to a set of COT ASDQ boards. This will be the first true measure of timing performance using real ASDQ signals and calibration pulses. These tests will be followed by reading out the CDF full-length COT prototype chamber with prototype TDCs.

M&S BOE:

Purchase scope, dvm's etc ~ \$20K

VME crate - \$15K

Labor BOE: N/A

1.3.1.6.2	Develop Test Protocols	\$33,600.00	\$33,600.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	50%	240 hrs	0 days	Thu 10/16/03	Thu 1/15/04	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	33,600	33,600	0 days	Thu 10/16/03	Thu 1/15/04	\$33,600.00	\$0.00	\$0.00	\$33,600.00

Notes

WBS Description:

Task to develop the TDC test protocols, including teststand software. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 12 wks (480 hrs) @\$70/hr = \$33600

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.6.3	Board Fabrication	\$5,055.00	\$5,055.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	5,055	5,055	0 days	Thu 10/16/03	Wed 11/5/03	\$5,055.00	\$0.00	\$0.00	\$5,055.00

Notes

WBS Description:

This item covers the cost of prototype TDC board fabrication

M&S BOE:

Spreadsheet of prototype assembly			
Item	Quan	Cost	Line Total
Prototype Run I (5 copies)			\$ 26,345
Board Fabrication			\$ 5,055
Tooling	1	575	575
Testing	1	850	850
Boards	6	605	3630
Parts			\$ 19,540
FPGAs	15	1200	18000
Connectors	50	8	400
Panels	6	40	240
Misc.	6	150	900
Assembly Svcs.			\$ 1,750
	5	350	1750

FPGA cost based upon quotations. Prototype board estimates based upon experience with Run 2a calorimeter calibration card.

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.6.4	Parts Procurement	\$19,540.00	\$19,540.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	19,540	19,540	0 days	Thu 10/16/03	Wed 11/5/03	\$19,540.00	\$0.00	\$0.00	\$19,540.00

Notes

WBS Description:

This item covers the cost for the parts of the prototype TDC board

M&S BOE:

Spreadsheet of prototype assembly			
Item	Quan	Cost	Line Total

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Parts Procurement" continued

Notes

Prototype Run I (5 copies)				\$ 26,345
Board Fabrication				\$ 5,055
Tooling	1	575	575	
Testing	1	850	850	
Boards	6	605	3630	
Parts				\$ 19,540
FPGAs	15	1200	18000	
Connectors	50	8	400	
Panels	6	40	240	
Misc.	6	150	900	
Assembly Svcs.				\$ 1,750
	5	350	1750	

Labor BOE: N/A

1.3.1.6.5	First Board Assembly	\$350.00	\$350.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	350	350	0 days	Thu 11/6/03	Wed 11/19/03	\$350.00	\$0.00	\$0.00	\$350.00

Notes

WBS Description:

This item covers the cost for assembly of the first test board

M&S BOE:

Spreadsheet of prototype assembly				
Item	Quan	Cost	Line Total	
Prototype Run I (5 copies)				\$ 26,345
Board Fabrication				\$ 5,055
Tooling	1	575	575	
Testing	1	850	850	
Boards	6	605	3630	
Parts				\$ 19,540
FPGAs	15	1200	18000	
Connectors	50	8	400	
Panels	6	40	240	
Misc.	6	150	900	
Assembly Svcs.				\$ 1,750

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"First Board Assembly" continued

Notes

	5	350	1750	
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Labor BOE: N/A

1.3.1.6.7	First Prototype TDC available for testing	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

Milestone - noting the first prototype TDC board available for testing.

1.3.1.6.8	Bench Tests	\$23,648.00	\$23,648.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	320 hrs	0 days	Thu 11/20/03	Fri 1/23/04	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	23,648	23,648	0 days	Thu 11/20/03	Fri 1/23/04	\$23,648.00	\$0.00	\$0.00	\$23,648.00

Notes

WBS Description:

This task covers the bench tests for the first prototype TDC board. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 8 wks (320 hrs) @\$70/hr = \$22400

10% Chicago Electrical Tech. - 8 wks (32 hrs) @\$39/hr = \$1248

1.3.1.6.9	Multiple Board Assy	\$1,400.00	\$1,400.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	1,400	1,400	0 days	Mon 12/15/03	Tue 12/30/03	\$1,400.00	\$0.00	\$0.00	\$1,400.00

Notes

WBS Description:

This item covers the cost for assembly of 4 more prototype TDC boards.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Multiple Board Assy" continued

Notes

M&S BOE:

4 x \$350.00 = \$1400.00

Spreadsheet of prototype assembly			
Item	Quan	Cost	Line Total
Prototype Run I (5 copies)			\$ 26,345
Board Fabrication			\$ 5,055
Tooling	1	575	575
Testing	1	850	850
Boards	6	605	3630
Parts			\$ 19,540
FPGAs	15	1200	18000
Connectors	50	8	400
Panels	6	40	240
Misc.	6	150	900
Assembly Svcs.			\$ 1,750
	5	350	1750

Labor BOE: N/A

1.3.1.6.10	Bench Tests	\$5,912.00	\$5,912.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	80 hrs	0 days	Fri 1/2/04	Thu 1/15/04	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	80 hrs	0 days	Fri 1/2/04	Thu 1/15/04	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	5,912	5,912	0 days	Fri 1/2/04	Thu 1/15/04	\$5,912.00	\$0.00	\$0.00	\$5,912.00

Notes

WBS Description:

This tasks covers the bench tests for the multiple prototype TDC's. The resources (money and/or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Bench Tests" continued

Notes

100% Chicago Electrical Eng. - 2 wks (80 hrs) @\$70/hr = \$5600
10% Chicago Electrical Tech. - 2 wks (8 hrs) @\$39/hr = \$312

1.3.1.6.11 B0 Tests \$8,400.00 \$8,400.00 \$0.00 1 1 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	200%	480 hrs	0 days	Fri 1/16/04	Fri 2/27/04	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	240 hrs	0 days	Fri 1/16/04	Fri 2/27/04	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	8,400	8,400	0 days	Fri 1/16/04	Fri 2/27/04	\$8,400.00	\$0.00	\$0.00	\$8,400.00

Notes

WBS Description:

This task covers the prototype TDC tests in B0 VME crates, both standalone and with the full length COT prototype chamber. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% Chicago Electrical Eng. - 6 wks (120 hrs) @\$70/hr = \$8400

1.3.1.6.12 Documentation \$9,800.00 \$9,800.00 \$0.00 1 1 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	50%	140 hrs	0 days	Fri 1/16/04	Fri 3/5/04	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	9,800	9,800	0 days	Fri 1/16/04	Fri 3/5/04	\$9,800.00	\$0.00	\$0.00	\$9,800.00

Notes

WBS Description:

This item covers the documentation of prototyping and testing of the TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Documentation" continued

Notes

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% Chicago Electrical Eng. - 7 wks (140 hrs) @\$70/hr = \$9800

1.3.1.6.13	Design Review	\$560.00	\$560.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	560	560	0 days	Mon 4/12/04	Mon 4/12/04	\$560.00	\$0.00	\$0.00	\$560.00

Notes

WBS Description:

This milestone refers to a design review after prototyping as a requirement for the commencement of preproduction and production. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

Note: A successful review on the "Prototype-V1.0" means that we are ready to proceed to the preproduction phase

M&S BOE: N/A

Labor BOE:

The cost of one day labor coverage of an engineer at the review meeting

100% Chicago Electrical Eng. - 1 day (8 hrs) @\$70/hr = \$560

1.3.1.7	Prototype - V1.0 (Chicago)	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description:

This summary task covers the first round of TDC prototypes including building the boards, debugging and evaluating their performance.

1.3.1.7.1	Develop Test Protocols	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Thu 10/16/03	Thu 1/15/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Task to develop the TDC test protocols, including teststand software. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Develop Test Protocols" continued

Notes
M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 12 wks (480 hrs) @\$70/hr = \$33600

1.3.1.7.2	Bench Tests	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Thu 11/20/03	Fri 1/23/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

This task covers the bench tests for the first prototype TDC board. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 8 wks (320 hrs) @\$70/hr = \$22400

1.3.1.7.3	Bench Tests(multi boards)	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Fri 1/2/04	Thu 1/15/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

This tasks covers the bench tests for the multiple prototype TDC's. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Bench Tests(multi boards)" continued

Notes

100% Chicago Electrical Eng. - 2 wks (80 hrs) @\$70/hr = \$5600

1.3.1.7.4	B0 Tests	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Mon 3/1/04	Fri 4/9/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task covers the prototype TDC tests in B0 VME crates, both standalone and with the full length COT prototype chamber. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% Chicago Electrical Eng. - 6 wks (120 hrs) @\$70/hr = \$8400

1.3.1.7.5	Documentation	\$0.00	\$0.00	\$0.00	1	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Fri 1/16/04	Fri 3/5/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers the documentation of prototyping and testing of the TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% Chicago Electrical Eng. - 7 wks (140 hrs) @\$70/hr = \$9800

WBS	Name					Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.7.6	Design Review					\$0.00	\$0.00	\$0.00	1	1	0
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	
11	INKIND	0	0	0 days	Mon 4/12/04	Mon 4/12/04	\$0.00	\$0.00	\$0.00	\$0.00	

Notes

WBS Description:

This milestone refers to a design review after prototyping as a requirement for the commencement of preproduction and production. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

Note: A successful review on the "Prototype-V1.0" means that we are ready to proceed to the preproduction phase

M&S BOE: N/A

Labor BOE:

The cost of one day labor coverage of an engineer at the review meeting

100% Chicago Electrical Eng. - 1 day (8 hrs) @\$70/hr = \$560

1.3.1.8	Design Review Milestone					\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

Milestone - completion of TDC design review after prototyping as a requirement for the commencement of preproduction and production

1.3.1.9	Preproduction (FNAL)					\$151,441.00	\$151,441.00	\$0.00	0	0	0
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Notes

WBS Description:

This summary task covers preproduction TDC board fabrication and performance testing with single and multiple boards.

1.3.1.9.1	TDC crate power supplies					\$2,000.00	\$2,000.00	\$0.00	0.3	0	0
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	
9	MANDS	2,000	2,000	0 days	Wed 6/23/04	Wed 7/7/04	\$2,000.00	\$0.00	\$0.00	\$2,000.00	

Notes

WBS Description:

This item covers the cost of power supplies to meet the TDC low voltage needs.

M&S BOE:

Two new TDC power supplies

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"TDC crate power supplies" continued

Notes

Subject:
TDC Power Supply for 2B
From:
Peter Wilson <pijw@fnal.gov>
Date:
Thu, 08 Aug 2002 14:06:58 -0500
To:
Kevin Pitts <kpitts@fnal.gov>
CC:
Robert Roser <roser@fnal.gov>

Hi Kevin,

I am assuming that the 1.8V requirements for the new TDC would be <5A/card or 100A/crate. In that case we would replace the 5V 150A module with a 2V 150A module which would be adjusted down to 1.8V. A rough estimate is as follows:

Materials per supply: \$900 for module + \$100 for misc materials for internal and external cable harness

Labor: 3 man-days/supply to remove, modify, re-install and modify PS->Crate power harness. (Tech Time)
Probably need ~2 man day total of engineer time to go over plans

Assume: 30 total supplies (20 + spares)

Total cost = \$30K
Total manpower = 30 man-days (tech) modify and install
2 man days engineering

Peter

Labor BOE: N/A

1.3.1.9.2	Production test equipment	\$40,000.00	\$40,000.00	\$0.00	0.5	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	40,000	40,000	0 days	Wed 6/23/04	Wed 7/7/04	\$40,000.00	\$0.00	\$0.00	\$40,000.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Production test equipment" continued

Notes

This item covers the cost for equipment for testing/debugging TDC boards

M&S BOE:

test equipment for testing/debugging the new board
logic analyzer and various other apparatus - \$40K

Labor BOE: N/A

1.3.1.9.3	Layout Modification	\$8,400.00	\$8,400.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	8,400	8,400	0 days	Wed 6/23/04	Wed 7/14/04	\$8,400.00	\$0.00	\$0.00	\$8,400.00

Notes

WBS Description:

This task covers the modification of the TDC board layout after prototyping. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 3 weeks (120 hrs) @ \$70/hr

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.9.4	Board Fabrication	\$5,297.00	\$5,297.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	5,297	5,297	0 days	Thu 7/15/04	Wed 8/4/04	\$5,297.00	\$0.00	\$0.00	\$5,297.00

Notes

WBS Description:

This task covers the cost of fabrication of the preproduction TDC boards

Note: We assume we still need the cost of "tooling/testing" after some moderate rework of design.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Parts Procurement" continued

Notes

FPGAs	45	1000	45000	
Connectors	160	8	1280	
Panels	20	40	800	
Misc.	20	150	3000	
Assembly Svcs.				\$ 3,000
	20	150	3000	

Labor BOE: N/A

1.3.1.9.6	First Board Assembly	\$150.00	\$150.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	150	150	0 days	Thu 8/5/04	Wed 8/18/04	\$150.00	\$0.00	\$0.00	\$150.00

Notes

WBS Description:

This item covers the cost for the assembly of the first preproduction TDC board

M&S BOE:

Item	Quan	Cost	Line Total
PreProduction Run (20 copies)			
Board Fabrication			\$ 5,297
Tooling	1	575	575
Testing	1	850	850
Boards	22	176	3872
Parts			\$ 50,080
FPGAs	45	1000	45000
Connectors	160	8	1280
Panels	20	40	800
Misc.	20	150	3000
Assembly Svcs.			\$ 3,000
	20	150	3000

Parts cost dominated by FPGAs and connectors.

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.1.9.7	Bench Tests	\$23,648.00	\$23,648.00	\$0.00	0.5	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	320 hrs	0 days	Thu 8/19/04	Thu 10/14/04	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	320 hrs	0 days	Thu 8/19/04	Thu 10/14/04	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	23,648	23,648	0 days	Thu 8/19/04	Thu 10/14/04	\$23,648.00	\$0.00	\$0.00	\$23,648.00

Notes

WBS Description:

This item covers the cost for the bench tests of the first preproduction TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of Electrical Engineer from U of Chicago 8 wks (320 hrs) @ \$70/hr
10% of Electrical Technician from U of Chicago 8 wks (32 hrs) @ \$39/hr

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.1.9.8	Multiple Board Assy	\$2,850.00	\$2,850.00	\$0.00	0.3	0	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	2,850	2,850	0 days	Fri 10/15/04	Thu 10/28/04	\$2,850.00	\$0.00	\$0.00	\$2,850.00

Notes

WBS Description:

This task covers the cost for the assembly of 19 preproduction TDC boards.

M&S BOE:

19 x \$150 = \$2850 (note: M&S here only covers assembly. Parts, board fabrication and NRE covered in previous items.)

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.1.9.9	Bench Tests	\$2,800.00	\$2,800.00	\$0.00	0.5	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	200%	160 hrs	0 days	Fri 10/29/04	Thu 11/11/04	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	2,800	2,800	0 days	Fri 10/29/04	Thu 11/11/04	\$2,800.00	\$0.00	\$0.00	\$2,800.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Bench Tests" continued

Notes

WBS Description:

This task describes the bench tests for the multiple preproduction TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

50% of Electrical Engineer from U of Chicago 2 wks (40 hrs) @ \$70/hr

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.9.10	B0 Tests	\$5,136.00	\$5,136.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	200%	480 hrs	0 days	Fri 11/12/04	Wed 12/29/04	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	240 hrs	0 days	Fri 11/12/04	Wed 12/29/04	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	5,136	5,136	0 days	Fri 11/12/04	Wed 12/29/04	\$5,136.00	\$0.00	\$0.00	\$5,136.00

Notes

WBS Description:

This task covers the preproduction TDC tests in B0 VME crates. Full crate tests will be the first opportunity to begin to investigate system effects both in board operation and timing precision/resolution. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

25% of Electrical Engineer from U of Chicago 6 weeks (60 hrs) @ \$70/hr
10% of Electrical Technician from U of Chicago 6 weeks (24 hrs) @ \$39/hr

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.9.11	Documentation	\$9,800.00	\$9,800.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	50%	140 hrs	0 days	Fri 11/12/04	Fri 1/7/05	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	9,800	9,800	0 days	Fri 11/12/04	Fri 1/7/05	\$9,800.00	\$0.00	\$0.00	\$9,800.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Documentation" continued

Notes

WBS Description:

This item covers the costs associated with the documentation of the preproduction boards and testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

50% of Electrical Engineer of U of Chicago 7 weeks (140h) @ \$70/hr

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.9.12	Design Review	\$560.00	\$560.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	560	560	0 days	Mon 1/10/05	Mon 1/10/05	\$560.00	\$0.00	\$0.00	\$560.00

Notes

WBS Description:

This milestone describes a TDC design review help to evaluate the status of the TDC boards ahead of the production phase of the project. This is a production readiness review. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

Note: a successful review at this stage means that we are ready to proceed to the production phase.

M&S BOE: N/A

Labor BOE:

100% of Electrical Engineer from U of Chicago 1d (8 hours) @ \$70/hr

Cost of one engineer attending the review

1.3.1.9.13	TDC Preproduction Contingency task	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.1.10	Preproduction (U of Chicago)	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description:

This summary task covers preproduction TDC board fabrication and performance testing with single and multiple boards.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Preproduction (U of Chicago)" continued

Notes

1.3.1.10.1	Layout Modification	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Wed 6/23/04	Wed 6/23/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task covers the modification of the TDC board layout after prototyping. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 3 weeks (120 hrs) @ \$70/hr

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.10.2	Bench Tests (first board)	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Thu 8/19/04	Thu 10/14/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers the cost for the bench tests of the first preproduction TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of Electrical Engineer from U of Chicago 8 wks (320 hrs) @ \$70/hr

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.10.3	Bench Tests(multiple boards)	\$0.00	\$0.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Fri 10/29/04	Thu 11/11/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task describes the bench tests for the multiple preproduction TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

50% of Electrical Engineer from U of Chicago 2 wks (40 hrs) @ \$70/hr

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.10.4	B0 Tests	\$0.00	\$0.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Fri 11/12/04	Wed 12/29/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task covers the preproduction TDC tests in B0 VME crates. Full crate tests will be the first opportunity to begin to investigate system effects both in board operation and timing precision/resolution. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

25% of Electrical Engineer from U of Chicago 6 weeks (60 hrs) @ \$70/hr

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.10.5	Documentation	\$0.00	\$0.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Fri 11/12/04	Fri 1/7/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Documentation" continued

Notes

This item covers the costs associated with the documentation of the preproduction boards and testing. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

50% of Electrical Engineer of U of Chicago 7 weeks (140h) @ \$70/hr

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.12	Beginning of TDC Production	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

Milestone - marking the beginning of TDC production after a successful production readiness review.

1.3.1.13	Production	\$480,898.00	\$471,850.00	\$9,048.00	0	0	0
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Notes

WBS Description:

This summary task covers the mass production of the TDC boards including quality assurance tests

1.3.1.13.1	TDC crate power supplies	\$28,000.00	\$28,000.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	28,000	28,000	0 days	Tue 1/11/05	Tue 1/25/05	\$28,000.00	\$0.00	\$0.00	\$28,000.00

Notes

WBS Description:

This item covers the cost of 28 new low voltage power supplies for the TDC boards

M&S BOE:

28 new TDC power supplies

Subject:

TDC Power Supply for 2B

From:

Peter Wilson <pjw@fnal.gov>

Date:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"TDC crate power supplies" continued

Notes

Thu, 08 Aug 2002 14:06:58 -0500

To:

Kevin Pitts <kpitts@fnal.gov>

CC:

Robert Roser <roser@fnal.gov>

Hi Kevin,

I am assuming that the 1.8V requirements for the new TDC would be <5A/card or 100A/crate. In that case we would replace the 5V 150A module with a 2V 150A module which would be adjusted down to 1.8V. A rough estimate is as follows:

Materials per supply: \$900 for module + \$100 for misc materials for internal and external cable harness

Labor: 3 man-days/supply to remove, modify, re-install and modify PS->Crate power harness. (Tech Time)
Probably need ~2 man day total of engineer time to go over plans

Assume: 30 total supplies (20 + spares)

Total cost = \$30K

Total manpower = 30 man-days (tech) modify and install
2 man days engineering

Peter

Labor BOE: N/A

1.3.1.13.2	Bid Documentation (FNAL)	\$8,400.00	\$8,400.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	8,400	8,400	0 days	Tue 1/11/05	Tue 2/1/05	\$8,400.00	\$0.00	\$0.00	\$8,400.00

Notes

WBS Description:

This task covers the documentation required for the bid of the production TDC order. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Bid Documentation (FNAL)" continued

Notes
Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 3 weeks (120 hrs) @ \$70/hr

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.13.3 Bid Documentation (Chicago) \$0.00 \$0.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Tue 1/11/05	Tue 2/1/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

This task covers the documentation required for the bid of the production TDC order. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 3 weeks (120 hrs) @ \$70/hr

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.13.4 Board Fabrication \$50,400.00 \$50,400.00 \$0.00 0.3 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	50,400	50,400	0 days	Wed 2/2/05	Tue 3/15/05	\$50,400.00	\$0.00	\$0.00	\$50,400.00

Notes
WBS Description:

This item covers the cost for the TDC board fabrication

M&S BOE:

	item	cost	line Total	
Production Run (350 copies)				
Board Fabrication			\$ 50,400	

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Board Fabrication" continued

Notes

Tooling	0	575	0				
Testing	0	850	0				
Boards	360	140	50400				
Parts							\$ 295,150
FPGAs	750	275	206250				
Connectors	2800	8	22400				
Panels	350	40	14000				
Misc.	350	150	52500				
Assembly Svcs.							\$ 45,500
	350	130	45500				

Labor BOE: N/A

1.3.1.13.5 Parts Procurement \$295,150.00 \$295,150.00 \$0.00 0.3 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish
9	MANDS	295,150	295,150	0 days	Wed 2/2/05	Tue 4/26/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	295,150	\$295,150.00	\$0.00	\$0.00	\$295,150.00

Notes

WBS Description:

This item covers the cost of the parts for the TDC boards

M&S BOE:

	item	cost	line Total	
Production Run (350 copies)				
Board Fabrication				\$ 50,400
Tooling	0	575	0	
Testing	0	850	0	
Boards	360	140	50400	
Parts				\$ 295,150
FPGAs	750	275	206250	
Connectors	2800	8	22400	
Panels	350	40	14000	
Misc.	350	150	52500	
Assembly Svcs.				\$ 45,500
	350	130	45500	

Cost for production quantity of Altera Stratix FPGAs \$275 as shown in quote from Altera.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Parts Procurement" continued

Notes

Labor BOE: N/A

1.3.1.13.6 Board Assembly \$45,500.00 \$45,500.00 \$0.00 0.3 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	45,500	45,500	0 days	Wed 4/27/05	Wed 6/22/05	\$45,500.00	\$0.00	\$0.00	\$45,500.00

Notes

WBS Description:

This item covers the cost of TDC board assembly

M&S BOE:

	item	cost	line Total	
Production Run (350 copies)				
Board Fabrication				\$ 50,400
Tooling	0	575	0	
Testing	0	850	0	
Boards	360	140	50400	
Parts				\$ 295,150
FPGAs	750	275	206250	
Connectors	2800	8	22400	
Panels	350	40	14000	
Misc.	350	150	52500	
Assembly Svcs.				\$ 45,500
	350	130	45500	

Labor BOE: N/A

1.3.1.13.7 Board Test (FNAL) \$53,448.00 \$44,400.00 \$9,048.00 0 0 0

Notes

WBS Description:

Summary task - production TDC board testing

1.3.1.13.7.1 Production Test Stands(hardware) \$22,000.00 \$22,000.00 \$0.00 0.3 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	22,000	22,000	0 days	Tue 1/11/05	Tue 2/22/05	\$22,000.00	\$0.00	\$0.00	\$22,000.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Production Test Stands(hardware)" continued

Notes

WBS Description:

This item covers the cost of a TDC test stand required for the testing of the production TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE:

Test fixtures include: pulser, crate power supply, computers and assorted test equipment

Test Fixtures and Misc. - Est.				\$ 22,000
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Cost estimate based upon previous experience with TDC test stands.

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 6 weeks (240 hrs) @ \$70/hr

1.3.1.13.7.1	Production Test Stands	\$16,800.00	\$16,800.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	240 hrs	0 days	Tue 1/11/05	Tue 2/22/05	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	16,800	16,800	0 days	Tue 1/11/05	Tue 2/22/05	\$16,800.00	\$0.00	\$0.00	\$16,800.00

Notes

WBS Description:

This item covers the cost of a TDC test stand required for the testing of the production TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE:

Test fixtures include: pulser, crate power supply, computers and assorted test equipment

Test Fixtures and Misc. - Est.				\$ 22,000
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Cost estimate based upon previous experience with TDC test stands.

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 6 weeks (240 hrs) @ \$70/hr

1.3.1.13.7.2	Test Software Revision	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	440 hrs	0 days	Wed 2/23/05	Tue 5/10/05	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	440 hrs	0 days	Wed 2/23/05	Tue 5/10/05	\$0.00	\$0.00	\$0.00	\$0.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Test Software Revision" continued

Notes

WBS Description:

This task covers the revision of the software required for the TDC boards

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.13.7.3	Test Data Base	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	PostDocF	100%	280 hrs	0 days	Wed 3/23/05	Tue 5/10/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task describes the formation of a database required for the QA tests of the production TDC boards

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.13.7.4	First Pass Tests	\$5,920.00	\$2,800.00	\$3,120.00	0	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	400 hrs	0 days	Thu 6/23/05	Thu 9/1/05	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	400 hrs	0 days	Thu 6/23/05	Thu 9/1/05	\$0.00	\$0.00	\$0.00	\$0.00
5	ElecTechF	20%	80 hrs	0 days	Thu 6/23/05	Thu 9/1/05	\$3,120.00	\$0.00	\$0.00	\$3,120.00
12	MANDSPASSL	2,800	2,800	0 days	Thu 6/23/05	Thu 9/1/05	\$2,800.00	\$0.00	\$0.00	\$2,800.00

Notes

WBS Description:

This item covers the initial tests of the production TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"First Pass Tests" continued

Notes

M&S BOE: N/A

Labor BOE:

The tests will mostly be done by physicists with help from technicians and engineer to fix the problems. 10 weeks is based on Run 2a experience

10% of 1 Electrical Engineering from U of Chicago - 10 weeks (40 hrs) @ \$70/hr

1.3.1.13.7.5	Rework	\$5,920.00	\$2,800.00	\$3,120.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	400 hrs	0 days	Fri 7/8/05	Fri 9/16/05	\$0.00	\$0.00	\$0.00	\$0.00
5	ElecTechF	20%	80 hrs	0 days	Fri 7/8/05	Fri 9/16/05	\$3,120.00	\$0.00	\$0.00	\$3,120.00
12	MANDSPASSL	2,800	2,800	0 days	Fri 7/8/05	Fri 9/16/05	\$2,800.00	\$0.00	\$0.00	\$2,800.00

Notes

WBS Description:

This task covers a rework discovered during the first pass testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

10% of 1 Electrical Engineering from U of Chicago - 10 weeks (40 hrs) @ \$70/hr

This task will be done in parallel to the later part of the first pass testing

1.3.1.13.7.6	Second Pass	\$2,808.00	\$0.00	\$2,808.00	0	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	360 hrs	0 days	Fri 7/29/05	Fri 9/30/05	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	360 hrs	0 days	Fri 7/29/05	Fri 9/30/05	\$0.00	\$0.00	\$0.00	\$0.00
5	ElecTechF	20%	72 hrs	0 days	Fri 7/29/05	Fri 9/30/05	\$2,808.00	\$0.00	\$0.00	\$2,808.00

Notes

WBS Description:

This task describes the testing done after the rework of the TDC boards. Boards passing this test will be declared ready for installation.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Second Pass" continued

Notes

M&S BOE: N/A

Labor BOE:

This task will have large overlap with the first pass tests and rework

1.3.1.13.8	Board Test (Chicago)	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task - production TDC board testing

1.3.1.13.8.1	Production Test Stands	\$0.00	\$0.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Tue 1/11/05	Tue 1/11/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers the cost of a TDC test stand required for the testing of the production TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 6 weeks (240 hrs) @ \$70/hr

Cost estimate based upon previous experience with TDC test stands.

1.3.1.13.8.2	First Pass Tests	\$0.00	\$0.00	\$0.00	0	1	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Thu 6/23/05	Thu 9/1/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers the initial tests of the production TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"First Pass Tests" continued

Notes

M&S BOE: N/A

Labor BOE:

10% of 1 Electrical Engineering from U of Chicago - 10 weeks (40 hrs) @ \$70/hr

The tests will mostly be done by physicists with help from technicians and engineer to fix the problems. 10 weeks is based on Run 2a experience

1.3.1.13.8.3	Rework	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Fri 7/8/05	Fri 9/16/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This task covers a rework discovered during the first pass testing. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

10% of 1 Electrical Engineering from U of Chicago - 10 weeks (40 hrs) @ \$70/hr

This task will be done in parallel to the later part of the first pass testing

1.3.1.13.10	Production Board testing complete	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

Milestone - marking the completion of the testing and QA of the production TDC boards.

1.3.1.14	Data Concentrator	\$230,526.00	\$176,626.00	\$53,900.00	0	0	0
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Notes

WBS Description:

Summary task covers design, prototyping and production of the Data Concentrator boards.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.14.1	Data Concentrator (R&D)	\$49,400.00	\$23,000.00	\$26,400.00	0	0	0
1.3.1.14.1.1	Readout Evaluation System	\$3,000.00	\$3,000.00	\$0.00	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	30%	96 hrs	0 days	Fri 9/27/02	Mon 11/25/02	\$0.00	\$0.00	\$0.00	\$0.00
9	MANDS	3,000	3,000	0 days	Fri 9/27/02	Mon 11/25/02	\$3,000.00	\$0.00	\$0.00	\$3,000.00

Notes

WBS Description:

This task covers the cost for a readout evaluation system .

M&S BOE:

Based on PO of VME control model 620 from SBS inc.

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.14.1.2	Design	\$17,600.00	\$0.00	\$17,600.00	0	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	PostDocF	100%	320 hrs	0 days	Tue 5/6/03	Tue 7/1/03	\$0.00	\$0.00	\$0.00	\$0.00
4	ElecEngF	100%	320 hrs	0 days	Tue 5/6/03	Tue 7/1/03	\$17,600.00	\$0.00	\$0.00	\$17,600.00

Notes

WBS Description:

This task covers the design of the data concentrator board

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.14.1.3	Layout	\$8,800.00	\$0.00	\$8,800.00	0	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	PostDocF	100%	160 hrs	0 days	Wed 7/2/03	Wed 7/30/03	\$0.00	\$0.00	\$0.00	\$0.00
4	ElecEngF	100%	160 hrs	0 days	Wed 7/2/03	Wed 7/30/03	\$8,800.00	\$0.00	\$0.00	\$8,800.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Layout" continued

Notes

This task covers the cost of the data concentrator board layout

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.14.1.4	Prototype fabrication	\$20,000.00	\$20,000.00	\$0.00	0.5	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	20,000	20,000	0 days	Thu 7/31/03	Thu 9/11/03	\$20,000.00	\$0.00	\$0.00	\$20,000.00

Notes

WBS Description:

Fabrication of the prototype data concentrator boards

M&S BOE:

Cost estimate based upon cost of CDF TRACER board for Run 2a system.

Labor BOE: N/A

1.3.1.14.2	Data Concentrator (Production)	\$171,226.00	\$153,626.00	\$17,600.00	0	0	0
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1.3.1.14.2.1	Layout modification	\$8,800.00	\$0.00	\$8,800.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	100%	160 hrs	0 days	Tue 4/20/04	Mon 5/17/04	\$8,800.00	\$0.00	\$0.00	\$8,800.00

Notes

WBS Description:

This task describes the modification of the data concentrator boards based on the results from the testing of the prototype boards.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.14.2.2	Data Concentrator Preproduction Review	\$0.00	\$0.00	\$0.00	0	0.5	0

Notes

WBS Description:

One day preproduction readiness review of data concentrator boards

M&S BOE: N/A

Labor BOE: N/A

1.3.1.14.2.3	Preproduction fabrication	\$20,000.00	\$20,000.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	20,000	20,000	0 days	Wed 5/19/04	Wed 6/30/04	\$20,000.00	\$0.00	\$0.00	\$20,000.00

Notes

WBS Description:

The cost for fabrication of the preproduction data concentration board

M&S BOE:

Cost estimate based upon similar prototype runs for the Run 2a system.

Labor BOE: N/A

1.3.1.14.2.4	Preproduction checkout	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	160 hrs	0 days	Thu 7/1/04	Thu 7/29/04	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	160 hrs	0 days	Thu 7/1/04	Thu 7/29/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Testing of the preproduction data concentrator boards

M&S BOE: N/A

Labor BOE: based on experience from Run 2a

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.14.2.5	Layout modification	\$8,800.00	\$0.00	\$8,800.00	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	100%	160 hrs	0 days	Fri 7/30/04	Thu 8/26/04	\$8,800.00	\$0.00	\$0.00	\$8,800.00

Notes

WBS Description:

Layout modification of the Data Concentrator board based on the testing results of the preproduction boards

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.14.2.6	Data Concentrator Production Review	\$0.00	\$0.00	\$0.00	0	0.5	0
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Notes

WBS Description:

Production rediness review for the Data Concentrator board.

M&S BOE: N/A

Labor BOE: N/A

Schedule BOE: lag of 100 days due to anticipated funding for FY2004

1.3.1.14.2.7	Production fabrication	\$125,000.00	\$125,000.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish
9	MANDS	125,000	125,000	0 days	Thu 1/27/05	Wed 3/9/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	125,000	\$125,000.00	\$0.00	\$0.00	\$125,000.00

Notes

WBS Description:

The fabrication of the production Data Concentrator boards

M&S BOE:

Cost estimated from previous experience with Run 2a TRACER and similar 9U VME boards.

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.14.2.8	Production checkout	\$0.00	\$0.00	\$0.00	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	100%	320 hrs	0 days	Thu 3/10/05	Wed 5/4/05	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	100%	320 hrs	0 days	Thu 3/10/05	Wed 5/4/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

Tests required for QA of the production Data Concentrator boards

M&S BOE: N/A

Labor BOE: Based on Run 2a experience

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.14.2.9	Purchase optical fibers	\$8,626.00	\$8,626.00	\$0.00	0.3	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	20%	32 hrs	0 days	Thu 5/5/05	Thu 6/2/05	\$0.00	\$0.00	\$0.00	\$0.00
9	MANDS	8,626	8,626	0 days	Thu 5/5/05	Thu 6/2/05	\$8,626.00	\$0.00	\$0.00	\$8,626.00

Notes
WBS Description:

The purchase of the optical fibers required for the production data concentrator

M&S BOE:

Cost estimated by: \$5/terminated end + \$0.50/foot of optical fiber.

Quantity required = 315 2 foot fibers + 35 spares = 350 2 foot fibers
20 250' fibers + 5 spares = 25 250' fibers

cost = 375 fibers * 2 ends* \$5/end + [350fibers*(2' length)+25fibers*(250'length)]*\$0.5/foot=\$8626

Estimates based upon recent optical fiber purchases for CDF.

Labor BOE:

Based on Run 2a experience

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.14.2.10	Data Concentrator schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.1.14.5	Test	\$9,900.00	\$0.00	\$9,900.00	0	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	PostDocF	100%	720 hrs	0 days	Fri 9/12/03	Mon 1/26/04	\$0.00	\$0.00	\$0.00	\$0.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Test" continued

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	25%	180 hrs	0 days	Fri 9/12/03	Mon 1/26/04	\$9,900.00	\$0.00	\$0.00	\$9,900.00

Notes

WBS Description:

Test of the prototype data concentrator boards

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.14.16	Data Concentrator Production Completed	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

Milestone - denoting the completion of the production Data Concentrator.

1.3.1.16	Run 2b TDC Ready for Installation	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

Milestone - denoting that the Run 2b TDC project is ready for installation at B0 (end of level 3 subproject).

1.3.2	Run 2b Level 2 Project	\$307,819.00	\$307,819.00	\$0.00	0	0	0
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Notes

WBS Description: This summary task covers the development and production of the Level 2 Trigger system

1.3.2.1	Start of Run 2b Level 2 Project	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description: Milestone denoting the start of the Level 2 Trigger Project

1.3.2.2	Testing and Software work existing L2 Pulsar test stand	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	150%	960 hrs	0 days	Wed 9/4/02	Mon 12/30/02	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	50%	320 hrs	0 days	Wed 9/4/02	Mon 12/30/02	\$0.00	\$0.00	\$0.00	\$0.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Testing and Software work existing L2 Pulsar test stand" continued

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	200%	1,280 hrs	0 days	Wed 9/4/02	Mon 12/30/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description: The prototype Pulsar board will be commissioned as part of a test stand for the Run 2A system. Specific tasks are: finish all mezzanine/Aux cards, Pulsar prototype testing, Rev B if needed; SLINK to PCI software work, test stand software, additional firmware work for testing ALL basic functionalities of prototypes

M&S BOE: N/A

Labor BOE: Based on Run 2A experience

1.3.2.3	Commission L2 Pulsar for each data path - proof of principle te:	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	150%	1,680 hrs	0 days	Thu 1/2/03	Mon 7/21/03	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	50%	560 hrs	0 days	Thu 1/2/03	Mon 7/21/03	\$0.00	\$0.00	\$0.00	\$0.00
7	PostDocU	200%	2,240 hrs	0 days	Thu 1/2/03	Mon 7/21/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description: The Pulsar board will be commissioned for each data path coming in to and out of the Level 2 decision system.

M&S BOE: N/A

Labor BOE: Based on Run 2A experience.

1.3.2.4	Preproduction run of Pulsar L2 system	\$145,515.00	\$145,515.00	\$0.00	0	0	0
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Notes

WBS Description: This task covers the preproduction run of the Level 2 system, which consists of three Pulsar boards, associated mezzanine cards, S-link boards and interface hardware, and L2 decision processor, and will be configured for a vertical slice test.

1.3.2.4.1	Preproduction Readiness Review Pulsar L2 system	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description: This milestone refers to a review of the results from commissioning the prototype Pulsar in teststand and for all data paths in preparation for preproduction

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Preproduction Readiness Review Pulsar L2 system" continued

Notes

1.3.2.4.2 Engineering on preproduction L2 system (FNAL) \$22,400.00 \$22,400.00 \$0.00 0.2 0.2 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	22,400	22,400	0 days	Thu 9/18/03	Wed 11/12/03	\$22,400.00	\$0.00	\$0.00	\$22,400.00

Notes

WBS Description:

This item covers engineering modifications for the L2 system based on prototype Pulsar commissioning. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 2 mon = 8 weeks (320 hrs) @ \$70/hr

Based on information from Run 2a - Pulsar test stand quotes			
Engineering	Quan	Cost	Total
2 months	2	\$10,000.00	\$20,000.00

U of C rate (as of Summer '02) \$55.25/hr

1.3.2.4.3 Engineering on preproduction L2 system (Chicago) \$0.00 \$0.00 \$0.00 0.2 0.2 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Thu 9/18/03	Wed 11/12/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers engineering modifications for the L2 system based on prototype Pulsar commissioning. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Engineering on preproduction L2 system (Chicago)" continued

Notes

100% of 1 Electrical Engineering from U of Chicago - 2 mon = 8 weeks (320 hrs) @ \$70/hr

Based on information from Run 2a - Pulsar test stand quotes			
Engineering	Quan	Cost	Total
2 months	2	\$10,000.00	\$20,000.00

U of C rate (as of Summer '02) \$55.25/hr

1.3.2.4.4	Motherboards Fabrication	\$18,600.00	\$18,600.00	\$0.00	0.15	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	18,600	18,600	0 days	Thu 11/13/03	Thu 1/15/04	\$18,600.00	\$0.00	\$0.00	\$18,600.00

Notes

WBS Description: This item covers the cost of components and fabrication for three Pulsar motherboards for the preproduction run.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
Motherboard Fabrication	Quan	Cost	Total
Boards	3	\$6,200.00	\$18,600.00

Labor BOE: N/A

1.3.2.4.5	Mezzanine boards Fabrication	\$13,000.00	\$13,000.00	\$0.00	0.15	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	13,000	13,000	0 days	Mon 11/24/03	Mon 1/12/04	\$13,000.00	\$0.00	\$0.00	\$13,000.00

Notes

WBS Description: This item covers the cost of fabrication and components for 20 mezzanine cards for the preproduction run.

M&S BOE:

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WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Mezzanine boards Fabrication" continued

Notes

from Run 2a quotes- Pulsar test stand quotes			
Mezzanine board fabrication	Quan	Cost	Total
Boards	20	\$650.00	\$13,000.00

Labor BOE: N/A

1.3.2.4.6	S-link Auxiliary boards	\$900.00	\$900.00	\$0.00	0.15	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	900	900	0 days	Mon 11/24/03	Mon 1/12/04	\$900.00	\$0.00	\$0.00	\$900.00

Notes

WBS Description: This item covers the fabrication and component costs for three S-Link boards for preproduction.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
S-link Auxiliary board	Quan	Cost	Total
Boards	3	\$300.00	\$900.00

Labor BOE: N/A

1.3.2.4.7	LSC/LDL + fiber boards	\$6,828.00	\$6,828.00	\$0.00	0.15	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	6,828	6,828	0 days	Wed 12/3/03	Tue 1/20/04	\$6,828.00	\$0.00	\$0.00	\$6,828.00

Notes

WBS Description: This item covers the cost of purchasing three Link Source Cards / Link Destination Cards and fibers for preproduction.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
LSC/LDL + fiber	Quan	Cost	Total
Boards	3	\$2,276.00	\$6,828.00

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"LSC/LDL + fiber boards" continued

Notes

1.3.2.4.8 PCI-> S-link boards \$2,574.00 \$2,574.00 \$0.00 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	2,574	2,574	0 days	Wed 12/10/03	Tue 1/27/04	\$2,574.00	\$0.00	\$0.00	\$2,574.00

Notes

WBS Description: This item covers the cost of purchasing three PCI -> S-Link interface boards for preproduction.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
PCI->S-link	Quan	Cost	Total
Boards	3	\$858.00	\$2,574.00

Labor BOE: N/A

1.3.2.4.9 S-link -> PCI boards \$3,213.00 \$3,213.00 \$0.00 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	3,213	3,213	0 days	Wed 12/10/03	Tue 1/27/04	\$3,213.00	\$0.00	\$0.00	\$3,213.00

Notes

WBS Description: This item covers the cost of purchasing three S-Link -> PCI boards for preproduction.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
S-link -> PCI	Quan	Cost	Total
Boards	3	\$1,071.00	\$3,213.00

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.2.4.10	L2 decision processor	\$8,000.00	\$8,000.00	\$0.00	0.15	0	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	8,000	8,000	0 days	Thu 9/18/03	Fri 2/6/04	\$8,000.00	\$0.00	\$0.00	\$8,000.00

Notes

WBS Description: This item covers the cost of purchasing two PC's for use as the L2 decision processor for preproduction.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
L2 decision processor	Quan	Cost	Total
PC	2	\$4,000.00	\$8,000.00

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.2.4.11	software development/memory management (FNAL)	\$70,000.00	\$70,000.00	\$0.00	0.2	0.2	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	70,000	70,000	0 days	Thu 9/18/03	Wed 9/15/04	\$70,000.00	\$0.00	\$0.00	\$70,000.00

Notes

WBS Description:

This item covers the engineering required to design and develop the Level 2 decision system software/memory management. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: NA

Labor BOE: Based on Run 2A experience

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.2.4.12	software development/memory management (Chicago)	\$0.00	\$0.00	\$0.00	0.2	0.2	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Thu 9/18/03	Wed 9/15/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

This item covers the engineering required to design and develop the Level 2 decision system software/memory management. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
"software development/memory management (Chicago)" continued										
<u>Notes</u>										
M&S BOE: NA										
Labor BOE: Based on Run 2A experience										
50% of 1 Electrical Engineering from U of Chicago - 50 weeks (1000 hrs) @ \$70/hr										
1.3.2.4.13	Preproduction Pulsar L2 system schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0			
1.3.2.5	Vertical Slice Test	\$0.00	\$0.00	\$0.00	0	0.5	0			
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>
1	PhysicistF	150%	1,200 hrs	0 days	Mon 2/9/04	Mon 6/28/04	\$0.00	\$0.00	\$0.00	\$0.00
2	PostDocF	50%	400 hrs	0 days	Mon 2/9/04	Mon 6/28/04	\$0.00	\$0.00	\$0.00	\$0.00
7	PostDocU	200%	1,600 hrs	0 days	Mon 2/9/04	Mon 6/28/04	\$0.00	\$0.00	\$0.00	\$0.00
<u>Notes</u>										
WBS Description: This item covers assembly of a vertical slice of the Level 2 system. Specific tasks include: use test stand to fine tune receiver firmware for each data path; system integration at crate level with test stand; L2 code testing for new system.										
M&S BOE: N/A										
Labor BOE: Based on Run 2A experience										
1.3.2.6	Production run of Pulsar L2 system	\$162,304.00	\$162,304.00	\$0.00	0	0	0			
<u>Notes</u>										
WBS Description: Summary task for Production Run of Pulsar Level 2 system: fabrication and purchase of boards, link hardware, L2 decision processors.										
1.3.2.6.1	Production Readiness Review for Level 2 Pulsar system	\$0.00	\$0.00	\$0.00	0	0	0			
<u>Notes</u>										
WBS Description: This milestone refers to a review of the preproduction tests / vertical slice results in preparation for the production run.										
M&S BOE: N/A										
Labor BOE:										
1.3.2.6.3	Begin production of Level2 Pulsar system	\$0.00	\$0.00	\$0.00	0	0	2			
<u>Notes</u>										
WBS Description:										
Milestone denoting beginning of production of Level 2 system.										

WBS	Name				Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.2.6.4	Motherboards Fabrication				\$80,600.00	\$80,600.00	\$0.00	0.15	0	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	80,600	80,600	0 days	Fri 11/12/04	Fri 1/14/05	\$80,600.00	\$0.00	\$0.00	\$80,600.00

Notes

WBS Description: This item covers the cost of components and fabrication for 13 Pulsar motherboards for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
Motherboard Fabrication	Quan	Cost	Total
Boards	13	\$6,200.00	\$80,600.00

Labor BOE: N/A

WBS	Name				Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.2.6.5	Mezzanine boards Fabrication				\$32,500.00	\$32,500.00	\$0.00	0.15	0	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	32,500	32,500	0 days	Tue 11/16/04	Wed 1/19/05	\$32,500.00	\$0.00	\$0.00	\$32,500.00

Notes

WBS Description: This item covers the cost of components and fabrication of 50 mezzanine cards for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
Mezzanine board fabrication	Quan	Cost	Total
Boards	50	\$650.00	\$32,500.00

Labor BOE: N/A

WBS	Name				Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.2.6.6	S-link Auxiliary boards				\$3,900.00	\$3,900.00	\$0.00	0.15	0	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	3,900	3,900	0 days	Thu 12/2/04	Wed 1/19/05	\$3,900.00	\$0.00	\$0.00	\$3,900.00

Notes

WBS Description: This item covers the cost of components and fabrication for 13 S-Link Auxilliary boards for the production system.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"S-link Auxiliary boards" continued

Notes
M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
S-link Auxiliary board	Quan	Cost	Total
Boards	13	\$300.00	\$3,900.00

Labor BOE: N/A

1.3.2.6.7	LSC/LDL + fiber boards	\$29,588.00	\$29,588.00	\$0.00	0.15	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	29,588	29,588	0 days	Thu 12/16/04	Wed 2/2/05	\$29,588.00	\$0.00	\$0.00	\$29,588.00

Notes
WBS Description: This item covers the cost of purchasing 13 Link Source Card/ Link Destination Cards and fibers for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
LSC/LDL + fiber	Quan	Cost	Total
Boards	13	\$2,276.00	\$29,588.00

Labor BOE: N/A

1.3.2.6.8	PCI-> S-link boards	\$3,432.00	\$3,432.00	\$0.00	0.15	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	3,432	3,432	0 days	Wed 1/19/05	Tue 3/1/05	\$3,432.00	\$0.00	\$0.00	\$3,432.00

Notes
WBS Description: This item covers the cost of purchasing 4 PCI -> S-link boards for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
PCI->S-link	Quan	Cost	Total

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"PCI-> S-link boards" continued

Notes

Boards	4	\$858.00	\$3,432.00
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Labor BOE: N/A

1.3.2.6.9 S-link -> PCI boards \$4,284.00 \$4,284.00 \$0.00 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	4,284	4,284	0 days	Wed 2/2/05	Tue 3/15/05	\$4,284.00	\$0.00	\$0.00	\$4,284.00

Notes

WBS Description: This item covers the cost of purchasing 4 S-link -> PCI boards for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
S-link -> PCI	Quan	Cost	Total
Boards	4	\$1,071.00	\$4,284.00

Labor BOE: N/A

1.3.2.6.10 L2 decision processor \$8,000.00 \$8,000.00 \$0.00 0.15 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	8,000	8,000	0 days	Tue 10/5/04	Wed 1/19/05	\$8,000.00	\$0.00	\$0.00	\$8,000.00

Notes

WBS Description: This item covers the cost of purchasing two PC's to be used as L2 decision processors.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
L2 decision processor	Quan	Cost	Total
PC	2	\$4,000.00	\$8,000.00

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level																																												
1.3.2.6.11	L2 Pulsar system - schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0																																												
1.3.2.7	System Integration standalone w/ test stand	\$0.00	\$0.00	\$0.00	0	0.5	0																																												
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Work</th> <th>Delay</th> <th>Start</th> <th>Finish</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>PhysicistF</td> <td>150%</td> <td>720 hrs</td> <td>0 days</td> <td>Wed 3/16/05</td> <td>Wed 6/8/05</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> </tr> <tr> <td>2</td> <td>PostDocF</td> <td>50%</td> <td>240 hrs</td> <td>0 days</td> <td>Wed 3/16/05</td> <td>Wed 6/8/05</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> </tr> <tr> <td>7</td> <td>PostDocU</td> <td>200%</td> <td>960 hrs</td> <td>0 days</td> <td>Wed 3/16/05</td> <td>Wed 6/8/05</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> </tr> </tbody> </table>	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	1	PhysicistF	150%	720 hrs	0 days	Wed 3/16/05	Wed 6/8/05	\$0.00	\$0.00	\$0.00	\$0.00	2	PostDocF	50%	240 hrs	0 days	Wed 3/16/05	Wed 6/8/05	\$0.00	\$0.00	\$0.00	\$0.00	7	PostDocU	200%	960 hrs	0 days	Wed 3/16/05	Wed 6/8/05	\$0.00	\$0.00	\$0.00	\$0.00						
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost																																									
1	PhysicistF	150%	720 hrs	0 days	Wed 3/16/05	Wed 6/8/05	\$0.00	\$0.00	\$0.00	\$0.00																																									
2	PostDocF	50%	240 hrs	0 days	Wed 3/16/05	Wed 6/8/05	\$0.00	\$0.00	\$0.00	\$0.00																																									
7	PostDocU	200%	960 hrs	0 days	Wed 3/16/05	Wed 6/8/05	\$0.00	\$0.00	\$0.00	\$0.00																																									
	<u>Notes</u>																																																		
	WBS Description: This item covers integration of the system, first using the Pulsar teststand to drive the Pulsar L2 system, and after studying/optimizing the performance, testing the L2 decision system using test runs with beam data.																																																		
	M&S BOE: N/A																																																		
	Labor BOE: Based on Run 2A experience.																																																		
1.3.2.9	Pulsar Level 2 subproject ready for installation	\$0.00	\$0.00	\$0.00	0	0	2																																												
	<u>Notes</u>																																																		
	WBS Description:																																																		
	Level 2 subproject ready for installation.																																																		
1.3.3	Run 2b XFTII Project	\$1,529,842.00	\$1,529,842.00	\$0.00	0	0	0																																												
	<u>Notes</u>																																																		
	WBS Description:																																																		
	Project to Upgrade the CDF Level 1 tracking trigger system.																																																		
1.3.3.1	Start of XFTII Project	\$0.00	\$0.00	\$0.00	0	0	3																																												
	<u>Notes</u>																																																		
	WBS Description:																																																		
	Milestone - marking the start of the XFTII upgrade project.																																																		
1.3.3.2	Finder Boards	\$638,480.00	\$638,480.00	\$0.00	0	0	0																																												
	<u>Notes</u>																																																		
	WBS Description:																																																		
	Development of axial and stereo segment Finder boards. These boards take hit information from the COT and find track segments in the COT superlayers.																																																		
1.3.3.2.1	Finder Board FPGA chip Firmware development	\$0.00	\$0.00	\$0.00	0	0.5	0																																												
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Work</th> <th>Delay</th> <th>Start</th> <th>Finish</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> </tr> </thead> <tbody> <tr> <td>6</td> <td>PhysicistU</td> <td>30%</td> <td>288 hrs</td> <td>0 days</td> <td>Tue 10/29/02</td> <td>Wed 4/23/03</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$0.00</td> </tr> </tbody> </table>	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	6	PhysicistU	30%	288 hrs	0 days	Tue 10/29/02	Wed 4/23/03	\$0.00	\$0.00	\$0.00	\$0.00																												
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost																																									
6	PhysicistU	30%	288 hrs	0 days	Tue 10/29/02	Wed 4/23/03	\$0.00	\$0.00	\$0.00	\$0.00																																									

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Finder Board FPGA chip Firmware development" continued

Notes

WBS Description:

Implementation of Firmware with Finder Algorithm

M&S BOE: N/A

Labor BOE:

1.3.3.2.2	Prototype Finder boards (OSU)	\$26,730.00	\$26,730.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task for development of prototype finder boards.

1.3.3.2.2.1	Study existing boards	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	30%	96 hrs	0 days	Tue 10/29/02	Fri 12/27/02	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Study data readout with existing finder boards for testing purposes. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.2.2.2	Prototype Finder 1/3 Board Schematic Design	\$2,640.00	\$2,640.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	20%	64 hrs	0 days	Tue 10/29/02	Fri 12/27/02	\$0.00	\$0.00	\$0.00	\$0.00
11	INKIND	2,640	2,640	0 days	Tue 10/29/02	Fri 12/27/02	\$2,640.00	\$0.00	\$0.00	\$2,640.00

Notes

WBS Description:

Prototype Finder 1/3 Board Schematic Design: choice of parts, routing of signals between parts. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Prototype Finder 1/3 Board Schematic Design" continued

Notes

M&S BOE: N/A

Labor BOE: Based on experience with Run 2A XFT

20% OSU Electrical Eng. - 8 w (80 hrs)@\$55/hr * 0.75 (In-Kind Engineering labor contribution rate) = \$2640

1.3.3.2.2.3	Prototype Finder 1/3 board layout	\$11,550.00	\$11,550.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	11,550	11,550	0 days	Mon 12/30/02	Wed 4/9/03	\$11,550.00	\$0.00	\$0.00	\$11,550.00

Notes

WBS Description:

Prototype Finder 1/3 board layout. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% OSU Electrical Eng. - 14 w (280 hrs)@\$55/hr * 0.75 (In-Kind Engineering labor contribution rate) = \$11550

1.3.3.2.2.4	Test Stand Setup	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	20%	32 hrs	0 days	Thu 4/10/03	Wed 5/7/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Setup of the VME crate and associated software for communication with crate. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE:

Actual costs of Run 2A Finger and current quotes for new parts

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Test Stand Setup" continued

Notes
Labor BOE:

1.3.3.2.2.5	Finder 1/3 board Prototype Testing	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	200%	960 hrs	0 days	Thu 5/8/03	Fri 8/1/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes
WBS Description:

Testing of fully loaded Finder 1/3 Prototypes. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE:

Labor BOE:
Based on experience with Run 2A XFT

1.3.3.2.2.6	Prototype Finder 2/4 Board Schematic Design	\$1,320.00	\$1,320.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	20%	32 hrs	0 days	Thu 4/10/03	Wed 5/7/03	\$0.00	\$0.00	\$0.00	\$0.00
11	INKIND	1,320	1,320	0 days	Thu 4/10/03	Wed 5/7/03	\$1,320.00	\$0.00	\$0.00	\$1,320.00

Notes
WBS Description:

Prototype Finder 2/4 PC board Schematic design: choice of parts, routing of signals between parts.
Very Similar to Finder 1/3 board. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Based on experience with Run 2A XFT

20% OSU Electrical Eng. - 4 w (32 hrs)@\$55/hr * 0.75 (In-Kind Engineering labor contribution rate) = \$1320

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.3.2.2.7	Prototype Finder SL7 Board Schematic Design	\$1,320.00	\$1,320.00	\$0.00	0.5	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	20%	32 hrs	0 days	Thu 4/10/03	Wed 5/7/03	\$0.00	\$0.00	\$0.00	\$0.00
11	INKIND	1,320	1,320	0 days	Thu 4/10/03	Wed 5/7/03	\$1,320.00	\$0.00	\$0.00	\$1,320.00

Notes

WBS Description:

Prototype Finder SL7 PC board Schematic design: choice of parts, routing of signals between parts.

Very Similar to Finder 1/3 board. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

20% OSU Electrical Eng. - 4 w (32 hrs)@\$55/hr * 0.75 (In-Kind Engineering labor contribution rate) = \$1320

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.3.2.2.8	Prototype Finder 2/4 board layout	\$4,950.00	\$4,950.00	\$0.00	0.5	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	4,950	4,950	0 days	Thu 5/8/03	Thu 6/19/03	\$4,950.00	\$0.00	\$0.00	\$4,950.00

Notes

WBS Description:

Prototype Finder 2/4 PC board layout - start from Finder 1/3 board layout. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A experience

50% OSU Electrical Eng. - 6 w (120 hrs)@\$55/hr * 0.75 (In-Kind Engineering labor contribution rate) = \$4950

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.2.9	Prototype Finder SL7 board layout	\$4,950.00	\$4,950.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	4,950	4,950	0 days	Fri 6/20/03	Fri 8/1/03	\$4,950.00	\$0.00	\$0.00	\$4,950.00

Notes

WBS Description:

Prototype Finder SL7 PC board layout - start from Finder 1/3 board layout. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on Run 2A XFT experience

50% OSU Electrical Eng. - 6 w (120 hrs)@\$55/hr * 0.75 (In-Kind Engineering labor contribution rate) = \$4950

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.2.10	Finder 2/4 board Prototype Testing	\$0.00	\$0.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	200%	640 hrs	0 days	Mon 8/18/03	Mon 10/13/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Testing of fully loaded Finder 2/4 Prototypes. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on Experience with Run 2A Finder Boards

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.2.2.11	Finder SL 7 board Prototype Testing	\$0.00	\$0.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	200%	640 hrs	0 days	Tue 9/30/03	Mon 11/24/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Testing of fully loaded Finder SL7 prototypes. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Finder SL 7 board Prototype Testing" continued

Notes

identical tasks.

M&S BOE: N/A

Labor BOE:

Based on Experience of Run 2A Finder boards

1.3.3.2.3	Prototype Finder boards (FNAL)	\$106,410.00	\$106,410.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task for development of prototype finder boards.

1.3.3.2.3.1	Prototype Finder 1/3 Board Schematic Design	\$8,880.00	\$8,880.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	8,880	8,880	0 days	Tue 10/29/02	Fri 12/27/02	\$8,880.00	\$0.00	\$0.00	\$8,880.00

Notes

WBS Description:

Prototype Finder 1/3 Board Schematic Design: choice of parts, routing of signals between parts. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE: Based on experience with Run 2A XFT

20% OSU Electrical Eng. - 8w (80 hrs) @\$55/hr * 0.25 (Reimbursement rate Engineering labor) = \$880

100% OSU Electrical Tech - 8w (3200 hrs)@\$25/hr = \$8000

1.3.3.2.3.2	Prototype Finder 1/3 board layout	\$10,850.00	\$10,850.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	10,850	10,850	0 days	Mon 12/30/02	Wed 4/9/03	\$10,850.00	\$0.00	\$0.00	\$10,850.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Prototype Finder 1/3 board layout" continued

Notes

Prototype Finder 1/3 board layout. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% OSU Electrical Eng. - 14w (280 hrs) @\$55/hr * 0.25 (Reimbursement rate Engineering labor) = \$3850

50% OSU Electrical Tech - 14 w (280 hrs)@\$25/hr = \$7000

1.3.3.2.3.4	Fabrication of Prototype Finder 1/3 board	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

This milestone denotes the fabrication of the first prototype Finder 1/3 board.

1.3.3.2.3.5	Fabricate Prototype Finder 1/3 board	\$12,500.00	\$12,500.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	12,500	12,500	0 days	Thu 4/10/03	Thu 6/5/03	\$12,500.00	\$0.00	\$0.00	\$12,500.00

Notes

WBS Description:

Fabrication of PC board and stuffing of components

M&S BOE:

Actual Costs of Run 2A Finger and current quotes for new parts

Fabricate 2 PC boards, purchase parts and stuff them - private company \$6250/board

for production quantities -

Finder System:

1/3 Boards:

Major Components:

Altera Stratix: \$1650

Altera Flex 10K: \$174

Xilinx FPGAs: \$1455

Secondary Components: \$951

PCB Fabrication: \$600

PCB Assembly: \$370

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
"Fabricate Prototype Finder 1/3 board" continued							
<u>Notes</u>							
	Total Cost/Board	\$5200					

Labor BOE:

1.3.3.2.3.6	Test Stand Setup	\$25,400.00	\$25,400.00	\$0.00	0.5	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	25,000	25,000	0 days	Thu 4/10/03	Wed 5/7/03	\$25,000.00	\$0.00	\$0.00	\$25,000.00
12	MANDSPASSL	400	400	0 days	Thu 4/10/03	Wed 5/7/03	\$400.00	\$0.00	\$0.00	\$400.00

Notes

WBS Description:

Setup of the VME crate and associated software for communication with crate. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE:

Actual costs of Run 2A Finger and current quotes for new parts

Labor BOE:

10% OSU Electrical Tech - 4w (16 hrs)@\$25/hr = \$400

1.3.3.2.3.7	Finder 1/3 board Prototype Testing	\$2,400.00	\$2,400.00	\$0.00	0.5	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	2,400	2,400	0 days	Thu 5/8/03	Fri 8/1/03	\$2,400.00	\$0.00	\$0.00	\$2,400.00

Notes

WBS Description:

Testing of fully loaded Finder 1/3 Prototypes. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE:

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Finder 1/3 board Prototype Testing" continued

Notes

20% OSU Electrical Tech - 12w (96hrs)@\$25/hr = \$2400

1.3.3.2.3.8	Prototype Finder 2/4 Board Schematic Design	\$4,440.00	\$4,440.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	4,440	4,440	0 days	Thu 4/10/03	Wed 5/7/03	\$4,440.00	\$0.00	\$0.00	\$4,440.00

Notes

WBS Description:

Prototype Finder 2/4 PC board Schematic design: choice of parts, routing of signals between parts.

Very Similar to Finder 1/3 board. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

20% OSU Electrical Eng. - 4w (32 hrs) @\$55/hr * 0.25 (Reimbursement rate Engineering labor) = \$440

100% OSU Electrical Tech - 4 w (160 hrs)@\$25/hr = \$4000

1.3.3.2.3.9	Prototype Finder SL7 Board Schematic Design	\$4,440.00	\$4,440.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	4,440	4,440	0 days	Thu 4/10/03	Wed 5/7/03	\$4,440.00	\$0.00	\$0.00	\$4,440.00

Notes

WBS Description:

Prototype Finder SL7 PC board Schematic design: choice of parts, routing of signals between parts.

Very Similar to Finder 1/3 board. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Prototype Finder SL7 Board Schematic Design" continued

Notes

20% OSU Electrical Eng. - 4w (32 hrs) @\$55/hr * 0.25 (Reimbursement rate Engineering labor) = \$440
100% OSU Electrical Tech - 4 w (160 hrs)@\$25/hr = \$4000

1.3.3.2.3.10	Prototype Finder 2/4 board layout	\$4,650.00	\$4,650.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	4,650	4,650	0 days	Thu 5/8/03	Thu 6/19/03	\$4,650.00	\$0.00	\$0.00	\$4,650.00

Notes

WBS Description:

Prototype Finder 2/4 PC board layout - start from Finder 1/3 board layout. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A experience

50% OSU Electrical Eng. - 6 w (120 hrs) @\$55/hr * 0.25 (Reimbursement rate Engineering labor) = \$1650
50% OSU Electrical Tech - 6 w (120 hrs)@\$25/hr = \$3000

1.3.3.2.3.11	Prototype Finder SL7 board layout	\$4,650.00	\$4,650.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	4,650	4,650	0 days	Fri 6/20/03	Fri 8/1/03	\$4,650.00	\$0.00	\$0.00	\$4,650.00

Notes

WBS Description:

Prototype Finder SL7 PC board layout - start from Finder 1/3 board layout. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on Run 2A XFT experience

50% OSU Electrical Eng. - 6 w (120 hrs) @\$55/hr * 0.25 (Reimbursement rate Engineering labor) = \$1650
50% OSU Electrical Tech - 6 w (120 hrs)@\$25/hr = \$3000

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Prototype Finder SL7 board layout" continued

Notes

1.3.3.2.3.12	Fabrication of Prototype Finder 2/4 board	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

This milestone denotes the fabrication of the first prototype Finder 2/4 board.

1.3.3.2.3.13	Fabricate Prototype Finder 2/4 board	\$12,500.00	\$12,500.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	12,500	12,500	0 days	Fri 6/20/03	Fri 8/15/03	\$12,500.00	\$0.00	\$0.00	\$12,500.00

Notes

WBS Description:

Fabrication of PC board and stuffing of components

M&S BOE:

Actual costs of Run 2A Finder and current quotes for new parts.

Fabricate 2 PC boards, purchase parts and stuff them - private company \$6250/board

For production quantities

2/4 Boards:

Major Components:

Altera Stratix: \$2200

Altera Flex 10K: \$232

Xilinx FPGAs: \$1435

Secondary Components: \$971

PCB Fabrication: \$600

PCB Assembly: \$370

 Total Cost/Board \$5808

Total Cost for

24+6 spares Boards: \$174,240

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.2.3.14	Fabrication of Prototype Finder SL7 board	\$0.00	\$0.00	\$0.00	0	0	3

Notes
WBS Description:

This milestone denotes the fabrication of the first prototype Finder SL7 board.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.2.3.15	Fabricate Prototype Finder SL7 board	\$12,500.00	\$12,500.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	12,500	12,500	0 days	Mon 8/4/03	Mon 9/29/03	\$12,500.00	\$0.00	\$0.00	\$12,500.00

Notes
WBS Description:

Fabrication of PC board and stuffing of components

M&S BOE:
Actual costs of Run 2A Finder and current quotes for new parts.

Fabricate 2 PC boards, purchase parts and stuff them - private company \$6250/board

for production quantities -

Finder System:
1/3 Boards:
Major Components:
Altera Stratix: \$1650
Altera Flex 10K: \$174
Xilinx FPGAs: \$1455
Secondary Components: \$951
PCB Fabrication: \$600
PCB Assembly: \$370

Total Cost/Board \$5200

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.2.3.16	Finder 2/4 board Prototype Testing	\$1,600.00	\$1,600.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,600	1,600	0 days	Mon 8/18/03	Mon 10/13/03	\$1,600.00	\$0.00	\$0.00	\$1,600.00

Notes
WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Finder 2/4 board Prototype Testing" continued

Notes

Testing of fully loaded Finder 2/4 Prototypes. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on Experience with Run 2A Finder Boards

20% OSU Electrical Tech - 8 w (64 hrs)@\$25/hr = \$1600

1.3.3.2.3.17	Finder SL 7 board Prototype Testing	\$1,600.00	\$1,600.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,600	1,600	0 days	Tue 9/30/03	Mon 11/24/03	\$1,600.00	\$0.00	\$0.00	\$1,600.00

Notes

WBS Description:

Testing of fully loaded Finder SL7 prototypes. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on Experience of Run 2A Finder boards

20% OSU Electrical Tech - 8 w (64 hrs)@\$25/hr = \$1600

1.3.3.2.4	Preproduction Finder Boards (OSU)	\$6,600.00	\$6,600.00	\$0.00	0	0	0
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Notes

WBS Description:

Preproduction Finder Boards: develop a small number (3) preproduction boards to test modifications determined during prototype testing.

1.3.3.2.4.1	Finder Board FPGA chp Firmware refinement	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	10%	72 hrs	0 days	Thu 4/24/03	Fri 8/29/03	\$0.00	\$0.00	\$0.00	\$0.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Finder Board FPGA chp Firmware refinement" continued

Notes

WBS Description:

Task to refine firmware on the finder board.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.2.4.2	Modification of Finder 1/3 board Schematic and Layout	\$4,950.00	\$4,950.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	4,950	4,950	0 days	Tue 10/14/03	Mon 11/24/03	\$4,950.00	\$0.00	\$0.00	\$4,950.00

Notes

WBS Description:

Modification of Finder 1/3 PC board schematic and layout: implement changes determined during prototype testing. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% - OSU Electrical Engineer 6 weeks (120 hrs) @ \$55/hr * 0.75 (In kind labor contribution rate) = \$4950

1.3.3.2.4.3	Testing Finder 1/3 preproduction boards	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	200%	320 hrs	0 days	Thu 1/29/04	Wed 2/25/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Testing of finder 1/3 preproduction boards. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Testing Finder 1/3 preproduction boards" continued

Notes

Labor BOE:
Based on experience with Run 2A XFT

1.3.3.2.4.4	Modification of Finder 2/4 Board Schematic and Layout	\$1,650.00	\$1,650.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	1,650	1,650	0 days	Tue 11/25/03	Wed 12/10/03	\$1,650.00	\$0.00	\$0.00	\$1,650.00

Notes

WBS Description:

Modification of Finder 2/4 board schematic and layout: implement changes determined during prototype testing. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% - OSU Electrical Eng. - 2 weeks (40 hrs) @ \$55/hr * 0.75 (InKind labor contribution factor) = \$1650

1.3.3.2.4.5	Testing Finder 2/4 preproduction boards	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	200%	320 hrs	0 days	Thu 2/12/04	Wed 3/10/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Testing of Finder 2/4 preproduction boards. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE:

Labor BOE:

Based on experience with Run 2A XFT

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.2.4.6	Modification of Finder SL7 board Schematic and Layout	\$0.00	\$0.00	\$0.00	0	0.5	0

Notes

WBS Description:

Modification of Finder 2/4 board schematic and layout: implement changes determined during prototype testing. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.2.4.7	Testing Finder SL7 preproduction boards	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	200%	320 hrs	0 days	Thu 3/18/04	Wed 4/14/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Testing Finder SL7 preproduction boards. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE:

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.2.4.8	Preproduction Finder 1/3 Board schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
1.3.3.2.4.8	Preproduction Finder 2/4 Board schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
1.3.3.2.4.8	Preproduction Finder SL7 Board schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
1.3.3.2.5	Preproduction Finder Boards(FNAL)	\$47,100.00	\$47,100.00	\$0.00	0	0	0

Notes

WBS Description:

Preproduction Finder Boards: develop a small number (3) preproduction boards to test modifications determined during prototype testing.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.3.2.5.1	Modification of Finder 1/3 board Schematic and Layout	\$4,650.00	\$4,650.00	\$0.00	0.5	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	4,650	4,650	0 days	Tue 10/14/03	Mon 11/24/03	\$4,650.00	\$0.00	\$0.00	\$4,650.00

Notes

WBS Description:

Modification of Finder 1/3 PC board schematic and layout: implement changes determined during prototype testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% - OSU Electrical Engineer - 6 weeks (120hrs) @ \$55/hr * 0.25 (FNAL reimbursement factor) = \$1650

50% - OSU Electrical Tech - 6 weeks (120hrs) @ \$25/hr = \$3000

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.3.2.5.2	Preproduction Finder1/3 board Fabrication	\$12,500.00	\$12,500.00	\$0.00	0.3	0	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	12,500	12,500	0 days	Tue 11/25/03	Wed 1/28/04	\$12,500.00	\$0.00	\$0.00	\$12,500.00

Notes

WBS Description:

Fabrication of PC board and stuffing of components

Produce 2 preproduction 1/3 Finder boards including PC board fabrication and stuffing

M&S BOE:

Actual costs of Run 2A Finder and current quotes for new parts

Produce 2 preproduction boards including fabrication and stuffing-

Finder System: - production quantities

1/3 Boards:

Major Components:

Altera Stratix: \$1650

Altera Flex 10K: \$174

Xilinx FPGAs: \$1455

Secondary Components: \$951

PCB Fabrication: \$600

PCB Assembly: \$370

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Preproduction Finder1/3 board Fabrication" continued

Notes

Total Cost/Board \$5200

Since this is two board run - use prototype cost. \$6250/board

Labor BOE:

1.3.3.2.5.3	Testing Finder 1/3 preproduction boards	\$800.00	\$800.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	800	800	0 days	Thu 1/29/04	Wed 2/25/04	\$800.00	\$0.00	\$0.00	\$800.00

Notes

WBS Description:

Testing of finder 1/3 preproduction boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE:

Labor BOE:

Based on experience with Run 2A XFT

20% - OSU Electrical Tech 4 weeks (32 hrs) @ \$25/hr

1.3.3.2.5.4	Modification of Finder 2/4 Board Schematic and Layout	\$1,550.00	\$1,550.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,550	1,550	0 days	Tue 11/25/03	Wed 12/10/03	\$1,550.00	\$0.00	\$0.00	\$1,550.00

Notes

WBS Description:

Modification of Finder 2/4 board schematic and layout: implement changes determined during prototype testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Modification of Finder 2/4 Board Schematic and Layout" continued

Notes

Based on experience with Run 2A XFT

50% - OSU Electrical Engineer - 2 weeks (40hrs) @ \$55/hr * 0.25 (FNAL reimburent factor) = \$550

50% - OSU Electrical Tech - 2 weeks (40hrs) @ \$25/hr = \$1000

1.3.3.2.5.5	Preproduction Finder 2/4 board Fabrication	\$12,500.00	\$12,500.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	12,500	12,500	0 days	Thu 12/11/03	Wed 2/11/04	\$12,500.00	\$0.00	\$0.00	\$12,500.00

Notes

WBS Description:

Produce 2 preproduction 2/4 Finder boards including PC board fabrication and stuffing

M&S BOE:

Actual costs of Run 2A Finder and current quotes for new parts.

Produce 2 preproduction boards including fabrication and stuffing-

Finder System: - production quantities

2/4 Boards:

Major Components:

Altera Stratix: \$2200

Altera Flex 10K: \$232

Xilinx FPGAs: \$1435

Secondary Components: \$971

PCB Fabrication: \$600

PCB Assembly: \$370

Total Cost/Board \$5808

Total Cost for

24+6 spares Boards: \$174,240

Since this is two board run - use prototype cost. \$6250/board

Labor BOE:

WBS	Name				Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.2.5.6	Testing Finder 2/4 preproduction boards				\$800.00	\$800.00	\$0.00	0.5	0.5	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	800	800	0 days	Thu 2/12/04	Wed 3/10/04	\$800.00	\$0.00	\$0.00	\$800.00

Notes

WBS Description:

Testing of Finder 2/4 preproduction boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE:

Labor BOE:

Based on experience with Run 2A XFT

20% OSU Electrical Tech - 4 weeks (32 hrs) @ \$25/hr

WBS	Name				Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.2.5.7	Modification of Finder SL7 board Schematic and Layout				\$1,000.00	\$1,000.00	\$0.00	0.5	0.5	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,000	1,000	0 days	Wed 1/7/04	Wed 1/21/04	\$1,000.00	\$0.00	\$0.00	\$1,000.00

Notes

WBS Description:

Modification of Finder 2/4 board schematic and layout: implement changes determined during prototype testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

50% OSU Electrical Tech - 2 weeks (40h) @ \$25/hr

Based on experience with Run 2A XFT

WBS	Name				Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.2.5.8	Preproduction Finder SL7 board Fabrication				\$12,500.00	\$12,500.00	\$0.00	0.3	0	0
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	12,500	12,500	0 days	Thu 1/22/04	Wed 3/17/04	\$12,500.00	\$0.00	\$0.00	\$12,500.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Preproduction Finder SL7 board Fabrication" continued

Notes

Produce 2 preproduction SL 7 Finder boards including PC board fabrication and stuffing

M&S BOE:

Actual costs of Run 2A Finder and current quotes for new parts.

Produce 2 preproduction boards including fabrication and stuffing-

Get updated price list

Finder System: - production quantities

SL Boards:

Major Components:

Altera Stratix: \$1650

Altera Flex 10K: \$174

Xilinx FPGAs: \$1455

Secondary Components: \$951

PCB Fabrication: \$600

PCB Assembly: \$370

Total Cost/Board \$5200

Since this is two board run - use prototype cost. \$6250/board

Labor BOE:

1.3.3.2.5.9	Testing Finder SL7 preproduction boards	\$800.00	\$800.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	800	800	0 days	Thu 3/18/04	Wed 4/14/04	\$800.00	\$0.00	\$0.00	\$800.00

Notes

WBS Description:

Testing Finder SL7 preproduction boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE:

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Testing Finder SL7 preproduction boards" continued

Notes
20% OSU Electrical Tech 4 weeks (32 hrs) @ \$25/hr
Based on experience with Run 2A XFT

1.3.3.2.6	Production Finder boards	\$446,640.00	\$446,640.00	\$0.00	0	0	0
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Notes
WBS Description:

Production Finder Boards: Fabrication, stuffing and testing of full set of Finder 1/3, Finder 2/4, Finder SL7 boards, including spares.

1.3.3.2.6.1	Production Readiness Review - Finder 1/3 boards	\$0.00	\$0.00	\$0.00	0	0	0
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Notes
WBS Description:

Production Readiness Review Finder 1/3 boards: CDF Finder 1/3 PC board, testing and QA certification

M&S BOE: N/A

Labor BOE: N/A

Schedule BOE: lag of 150 days due to anticipated funding for FY2004

1.3.3.2.6.2	Production of Finder 1/3 boards	\$156,000.00	\$156,000.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish
10	MANDSPASS	156,000	156,000	0 days	Wed 9/29/04	Wed 1/12/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	156,000	\$156,000.00	\$0.00	\$0.00	\$156,000.00

Notes
WBS Description:

Production of Finder 1/3 boards: Fabrication of PC boards and stuffing of components.

M&S BOE:

Actual costs of Run 2A Finder and current quotes for new parts.

Need 24 + (6 spare) Finder 1/3
Total boards - Finder 1/3 - SL7 boards - \$5200/board = \$156,000

1/3 Boards:
Major Components:
Altera Stratix: \$1650

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Production of Finder 1/3 boards" continued

Notes

Altera Flex 10K:	\$174
Xilinx FPGAs:	\$1455
Secondary Components:	\$951
PCB Fabrication:	\$600
PCB Assembly:	\$370

Total Cost/Board	\$5200

Labor BOE: N/A

1.3.3.2.6.3	Test Production Finder 1/3 boards	\$2,400.00	\$2,400.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	150%	720 hrs	0 days	Thu 1/13/05	Thu 4/7/05	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	2,400	2,400	0 days	Thu 1/13/05	Thu 4/7/05	\$2,400.00	\$0.00	\$0.00	\$2,400.00

Notes

WBS Description:

Test and checkout of Production Finder 1/3 boards.

M&S BOE: N/A

Labor BOE:

Testing Experience with Run 2A boards

20% - OSU Electrical Tech 12 wks (96 hrs) @\$25/hr = \$2400

1.3.3.2.6.4	Production Readiness Review - Finder 2/4 boards	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description:

Production Readiness Review Finder 2/4 boards: CDF Finder 2/4 PC board, testing and QA certification

M&S BOE: N/A

Labor BOE: N/A

Schedule BOE: lag of 150 days due to anticipated funding for FY2004

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.2.6.5	Production of Finder 2/4 boards	\$174,240.00	\$174,240.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
10	MANDSPASS	174,240	174,240	0 days	Wed 10/13/04	Thu 1/27/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	174,240	\$174,240.00	\$0.00	\$0.00	\$174,240.00

Notes

WBS Description:

Production of Finder 2/4 boards: Fabrication of PC boards and stuffing of components

M&S BOE:

Actual costs of Run 2A Finder and current quotes for new parts.
 Need 24 + (6 spare) Finder 2/4 boards for SL 4 and SL 8

Total boards - 30 Finder 2/4 boards - \$5808/board = \$174,240.00

2/4 Boards:

Major Components:

Altera Stratix: \$2200

Altera Flex 10K: \$232

Xilinx FPGAs: \$1435

Secondary Components: \$971

PCB Fabrication: \$600

PCB Assembly: \$370

 Total Cost/Board \$5808

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.2.6.6	Test Production Finder 2/4 boards	\$2,400.00	\$2,400.00	\$0.00	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	150%	720 hrs	0 days	Fri 1/28/05	Thu 4/21/05	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	2,400	2,400	0 days	Fri 1/28/05	Thu 4/21/05	\$2,400.00	\$0.00	\$0.00	\$2,400.00

Notes

WBS Description:

Test and checkout of Production Finder 1/3 boards.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Test Production Finder 2/4 boards" continued

Notes

Labor BOE:

Testing Experience with Run 2A boards

20% - OSU Electrical Tech 12 wks (96 hrs) @\$25/hr = \$2400

1.3.3.2.6.7	Production Readiness Review - Finder SL 7 boards	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description:

Production Readiness Review Finder SL boards: CDF Finder SL7 PC board, testing and QA certification

M&S BOE: N/A

Labor BOE: N/A

Schedule BOE: lag of 125 days due to anticipated funding for FY2004

1.3.3.2.6.9	Begin Production Finder SL7 boards	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

This milestone marks the beginning of production for the Finder SL7 boards after a successful production readiness review.

1.3.3.2.6.10	Production of Finder SL7 boards	\$109,200.00	\$109,200.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish
10	MANDSPASS	109,200	109,200	0 days	Wed 10/13/04	Thu 1/27/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	109,200	\$109,200.00	\$0.00	\$0.00	\$109,200.00

Notes

WBS Description:

Production of Finder SL boards: Fabrication of PC boards and stuffing of components

M&S BOE:

Actual costs of Run 2A Finder and current quotes for new parts.

Need updated costs

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Production of Finder SL7 boards" continued

Notes

Need 18 + (3 spare) Finder SL 7 boards
 Total boards - SL7 boards - \$5200/board = \$109,200

SL Boards:

Major Components:

Altera Stratix: \$1650

Altera Flex 10K: \$174

Xilinx FPGAs: \$1455

Secondary Components: \$951

PCB Fabrication: \$600

PCB Assembly: \$370

 Total Cost/Board \$5200

Labor BOE: N/A

1.3.3.2.6.11	Test Production Finder SL7 boards	\$2,400.00	\$2,400.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	150%	720 hrs	0 days	Fri 1/28/05	Thu 4/21/05	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	2,400	2,400	0 days	Fri 1/28/05	Thu 4/21/05	\$2,400.00	\$0.00	\$0.00	\$2,400.00

Notes

WBS Description:

Test and checkout of Production Finder 1/3 boards.

M&S BOE: N/A

Labor BOE:

Testing Experience with Run 2A boards

20% - OSU Electrical Tech 12 wks (96 hrs) @\$25/hr = \$2400

1.3.3.2.7	Finder3D backplane	\$5,000.00	\$5,000.00	\$0.00	0	0	0
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Notes

WBS Description:

Finder 3D backplane.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.2.7.1	Finder3d backplane Layout	\$1,000.00	\$1,000.00	\$0.00	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	10%	16 hrs	0 days	Mon 6/23/03	Mon 7/21/03	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	1,000	1,000	0 days	Mon 6/23/03	Mon 7/21/03	\$1,000.00	\$0.00	\$0.00	\$1,000.00

Notes
WBS Description:

Layout of Finder 3D backplane

M&S BOE: N/A

Labor BOE:

Run 2A Finder backplane layout

25% - OSU Electrical Tech 4 wks (40 hrs) @\$25/hr = \$1000

1.3.3.2.7.2	Finder3d Backplane Production Readiness Review	\$0.00	\$0.00	\$0.00	0	0	0
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Notes
WBS Description:

Production Readiness review for the Finder3D Backplane.

MS BOE: N/A

Labor BOE:

1.3.3.2.7.3	Finder3d backplane Fabrication and Stuffing	\$4,000.00	\$4,000.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	4,000	4,000	0 days	Wed 7/23/03	Tue 8/19/03	\$4,000.00	\$0.00	\$0.00	\$4,000.00

Notes
WBS Description:

Finder 3D backplane Fabrication and Stuffing

M&S BOE:

Actual costs of Run 2A Finder and current quotes for new parts.

\$4,000 + contingency for two finder3d backplanes

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.3.2.8	Prototype Finder boards schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0			
1.3.3.3	Test equipment	\$25,000.00	\$25,000.00	\$0.00	0.3	0	0			
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>
9	MANDS	25,000	25,000	0 days	Thu 11/14/02	Fri 11/29/02	\$25,000.00	\$0.00	\$0.00	\$25,000.00

Notes

WBS Description:

purchase test equipment for production testing of boards

M&S BOE:

DVM's , oscilloscope, probes.

Labor BOE:

1.3.3.4	TDC Transition Module	\$31,400.00	\$31,400.00	\$0.00	0	0	0
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Notes

WBS Description:

TDC Transition Module: The design for these boards already exists and is being used in the Run 2A design. Additional boards are required for the Stereo Segment Finding. We need 54 boards + 6 spares.

1.3.3.4.1	TDC Transition Module Production Readiness Review	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Definition:

Production Readiness Review for TDC Transition Module

M&S BOE: N/A

Labor BOE:

1.3.3.4.2	TDC Transition Module board Fabrication	\$29,000.00	\$29,000.00	\$0.00	0.3	0	0
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<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>
10	MANDSPASS	29,000	29,000	0 days	Tue 2/25/03	Mon 5/19/03	\$29,000.00	\$0.00	\$0.00	\$29,000.00

Notes

WBS Description:

This board uses an existing Design -
This includes stuffing board
PC board cost - 54+ 6 spares = \$29,000 + contingency

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"TDC Transition Module board Fabrication" continued

Notes

M&S BOE:

Actual cost of Run 2A boards

Labor BOE: N/A

1.3.3.4.3	TDC Transition Module board production checkout	\$2,400.00	\$2,400.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	80%	384 hrs	0 days	Tue 5/20/03	Wed 8/13/03	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	2,400	2,400	0 days	Tue 5/20/03	Wed 8/13/03	\$2,400.00	\$0.00	\$0.00	\$2,400.00

Notes

WBS Description:

TDC Transition Module production board testing and QA.

M&S BOE: N/A

Labor BOE:

Checkout time for Run 2A boards

20% - OSU Electrical Tech 12 wks (96 hrs) @\$25/hr = \$2400

1.3.3.4.4	TDC Transition Module schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.3.5	Finder Transition Module	\$21,600.00	\$21,600.00	\$0.00	0	0	0
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Notes

WBS Description:

Finder Transition Module: The design for this board already exists and is being used. Additional boards are required for the Stereo segment finders. We need 18 boards + 12 spares

1.3.3.5.1	Production Readiness Review - Finder Transition board	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Definition:

Production Readiness Review for Finder Transition Module

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.5.2	Finder Transition board Fabrication	\$20,000.00	\$20,000.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	20,000	20,000	0 days	Tue 5/20/03	Wed 7/16/03	\$20,000.00	\$0.00	\$0.00	\$20,000.00

Notes

WBS Definition:
Fabricate and stuff 18 + 2 spare Finder Transition Module cost \$20K with contingency
This board uses an existing design

M&S BOE:

Actual Costs of Run 2A boards

Labor BOE: N/A

1.3.3.5.3	Production Finder Transition Module checkout	\$1,600.00	\$1,600.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	80%	256 hrs	0 days	Thu 7/17/03	Thu 9/11/03	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	1,600	1,600	0 days	Thu 7/17/03	Thu 9/11/03	\$1,600.00	\$0.00	\$0.00	\$1,600.00

Notes

WBS Description:

Production Finder Transition Module testing and QA.

M&S BOE: N/A

Labor BOE:

Testing time for Run 2A boards

20% - OSU Electrical Tech 8 wks (64 hrs) @\$25/hr = \$1600

1.3.3.5.4	Finder Transition Module schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.3.6	Finder3D Tester Board	\$13,600.00	\$13,600.00	\$0.00	0	0	0
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Notes

WBS Description:

Finder 3D Tester Board used to test Stereo Finder boards
need 1 board

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.6.1	Finder3D Tester Board schematic design and layout (OSU)	\$4,950.00	\$4,950.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	10%	24 hrs	0 days	Mon 5/19/03	Mon 6/30/03	\$0.00	\$0.00	\$0.00	\$0.00
11	INKIND	4,950	4,950	0 days	Mon 5/19/03	Mon 6/30/03	\$4,950.00	\$0.00	\$0.00	\$4,950.00

Notes
WBS Description:

Finder 3D Tester board schematic design and layout. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Design time for run 2a tester boards

50% - OSU Electrical Engineer - 6 wks (120 hrs) @ \$55/hr * 0.75 (INKIND labor contribution factor) = \$4950

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.6.2	Finder3D Tester Board schematic design and layout (FNAL)	\$4,650.00	\$4,650.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	4,650	4,650	0 days	Mon 5/19/03	Mon 6/30/03	\$4,650.00	\$0.00	\$0.00	\$4,650.00

Notes
WBS Description:

Finder 3D Tester board schematic design and layout. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Design time for run 2a tester boards

50% - OSU Electrical Tech - 6 wks (120 hrs) @ \$25/hr = \$3000
50% - OSU Electrical Eng - 6 wks (120 hrs) @ \$55/hr * 0.25 (Eng labor reimbursement rate) = \$1650

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.6.3	Finder3D Tester board fabrication	\$4,000.00	\$4,000.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	4,000	4,000	0 days	Tue 7/1/03	Tue 7/29/03	\$4,000.00	\$0.00	\$0.00	\$4,000.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Finder3D Tester board fabrication" continued

Notes
 WBS Description:

Fabrication and stuffing of 1 Finder 3D tester board - \$4K + contingency

M&S BOE:

Cost of Run 2A Tester Boards

Labor BOE: N/A

1.3.3.6.4	Finder3D tester board schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.3.7	Cables	\$8,000.00	\$8,000.00	\$0.00	0	0	0
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Notes
 WBS Description:

1.3.3.7.1	Finder3D to Stereo Association Module cables fab	\$4,000.00	\$4,000.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	10%	16 hrs	0 days	Thu 10/30/03	Wed 11/26/03	\$0.00	\$0.00	\$0.00	\$0.00
9	MANDS	4,000	4,000	0 days	Thu 10/30/03	Wed 11/26/03	\$4,000.00	\$0.00	\$0.00	\$4,000.00

Notes
 WBS Description:

Finder3D to Stereo Association Module cable fabrication + installation -

M&S BOE:

cost \$8000 + contingency Cost of Run 2A Linker to XTRP Cables

Labor BOE:

1.3.3.7.2	Linker Output Module-II to Stereo Assoc. Module cable Fab.	\$4,000.00	\$4,000.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	10%	16 hrs	0 days	Mon 12/1/03	Tue 12/30/03	\$0.00	\$0.00	\$0.00	\$0.00
9	MANDS	4,000	4,000	0 days	Mon 12/1/03	Tue 12/30/03	\$4,000.00	\$0.00	\$0.00	\$4,000.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Linker Output Module-II to Stereo Assoc. Module cable Fab." continued

Notes

WBS Description:

Linker Output Module-II to Stereo Association Module cable fabrication

M&S BOE:

Linker Output Module-II to Stereo Association Module cables fabrication and installation
\$8000 + 15% contingency - done at Shutdown

Labor BOE:

1.3.3.7.4	Cables schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.3.8	Linker Modules	\$259,544.00	\$259,544.00	\$0.00	0	0	0
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Notes

WBS Description:

Linker Modules provide the segment linking between axial layers of the COT. It uses input from the Finders and outputs a track list with Pt and Phi information to the rest of the trigger system. We require 12 boards + 4 spares.

1.3.3.8.1	Prototype Linker Modules	\$62,037.00	\$62,037.00	\$0.00	0	0	0
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Notes

WBS Description:

Prototype Linker Modules provide a means to test the PC board layout and algorithms.

1.3.3.8.1.1	Prototype Linker Module Schematic Design (FNAL)	\$6,200.00	\$6,200.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	50%	160 hrs	0 days	Thu 10/31/02	Thu 1/2/03	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	6,200	6,200	0 days	Thu 10/31/02	Thu 1/2/03	\$6,200.00	\$0.00	\$0.00	\$6,200.00

Notes

WBS Description:

Schematic design of the Linker PC board including all I/O, control, and processing components. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Prototype Linker Module Schematic Design (FNAL)" continued

Notes

Based on experience with Run 2A XFT

50% - OSU Electrical Eng - 8 w (160 hrs) @\$55/hr * 0.25 (Eng. labor reimbursment rate) = \$2200
50% - OSU Electrical Tech - 8 w (160 hrs) @\$25/hr = \$4000

1.3.3.8.1.2 Prototype Linker Module Schematic Design (OSU) \$6,600.00 \$6,600.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	50%	160 hrs	0 days	Thu 10/31/02	Thu 1/2/03	\$0.00	\$0.00	\$0.00	\$0.00
11	INKIND	6,600	6,600	0 days	Thu 10/31/02	Thu 1/2/03	\$6,600.00	\$0.00	\$0.00	\$6,600.00

Notes

WBS Description:

Schematic design of the Linker PC board including all I/O, control, and processing components. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% OSU Electrical Eng. - 8 w (160 hrs)@\$55/hr * 0.75 (In-Kind Engineering labor contribution rate) = \$6600

1.3.3.8.1.3 Prototype Linker Module pc board layout (FNAL) \$10,850.00 \$10,850.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	10,850	10,850	0 days	Fri 1/3/03	Fri 4/11/03	\$10,850.00	\$0.00	\$0.00	\$10,850.00

Notes

WBS Description:

Prototype Linker Module PC board layout, including parts placement and trace routing.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Prototype Linker Module pc board layout (FNAL)" continued

Notes

50% - OSU Electrical Eng - 14 w (280 h) @\$55/hr * 0.25 (Eng. labor reimbursment rate) = \$3850
50% - OSU Electrical Tech - 14 w (280 h) @\$25/hr = \$7000

1.3.3.8.1.4	Prototype Linker Module pc board layout (OSU)	\$11,550.00	\$11,550.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	11,550	11,550	0 days	Fri 1/3/03	Fri 4/11/03	\$11,550.00	\$0.00	\$0.00	\$11,550.00

Notes

WBS Description:

Prototype Linker Module PC board layout, including parts placement and trace routing. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% OSU Electrical Eng. - 14 w (280 hrs)@\$55/hr * 0.75 (In-Kind Engineering labor contribution rate) = \$11550

1.3.3.8.1.5	FPGA Firmware Development	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	50%	240 hrs	0 days	Fri 1/3/03	Fri 3/28/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Definition:

Development of the FPGA algorithms and firmware to implement the track linking algorithms

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.3.8.1.6	Prototype Linker Module pc board fabrication	\$14,037.00	\$14,037.00	\$0.00	0.3	0	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	14,037	14,037	0 days	Mon 4/14/03	Mon 6/9/03	\$14,037.00	\$0.00	\$0.00	\$14,037.00

Notes

WBS Description:

Prototype Linker Module PC board fabrication and stuffing

M&S BOE:

Actual costs of Run 2A Linker boards and current quotes for new parts

Prototype Linker board cost - 2 boards - \$14,037

Production board costs

Linker System:

Major Components:

Altera Stratix: \$3300

Altera Flex 10K: \$1035

Secondary Components: \$ 384

PCB Fabrication: \$ 600

PCB Assembly: \$ 370

Total Cost/Board \$5689

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.3.8.1.7	Linker Module Test Stand Setup	\$10,400.00	\$10,400.00	\$0.00	0.3	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	20%	32 hrs	0 days	Mon 4/14/03	Fri 5/9/03	\$0.00	\$0.00	\$0.00	\$0.00
10	MANDSPASS	10,000	10,000	0 days	Mon 4/14/03	Fri 5/9/03	\$10,000.00	\$0.00	\$0.00	\$10,000.00
12	MANDSPASSL	400	400	0 days	Mon 4/14/03	Fri 5/9/03	\$400.00	\$0.00	\$0.00	\$400.00

Notes

WBS Definition:

Test stand for Link Board and for Linker Output Modules. It will be used for both prototype testing and production checkout and QA.

M&S BOE:

Based on experience with Run 2A XFT and the use of existing infrastructure

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
"Linker Module Test Stand Setup" continued										
<u>Notes</u>										
Based on experience with Run 2A XFT.										
10% OSU Electrical Tech - 4w (16hrs) @\$25/hr = \$400										
1.3.3.8.1.9	Prototype Linker Module available for testing	\$0.00	\$0.00	\$0.00	0	0	2			
<u>Notes</u>										
WBS Description:										
This milestone denotes when the first prototype Linker module will be available for testing.										
1.3.3.8.1.10	Prototype Linker Module testing	\$2,400.00	\$2,400.00	\$0.00	0	0.5	0			
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>
7	PostDocU	200%	960 hrs	0 days	Tue 6/10/03	Wed 9/3/03	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	2,400	2,400	0 days	Tue 6/10/03	Wed 9/3/03	\$2,400.00	\$0.00	\$0.00	\$2,400.00
<u>Notes</u>										
WBS Description:										
Prototype Linker Module testing including at speed input of data and capture of output data to verify board operation.										
M&S BOE: N/A										
Labor BOE:										
Based on experience with Run 2A XFT										
20% OSU Electrical Tech - 12w (96 hrs)@\$25/hr = \$2400										
1.3.3.8.1.11	Prototype Linker Modules schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0			
1.3.3.8.2	Preproduction Linker Modules	\$24,437.00	\$24,437.00	\$0.00	0	0	0			
<u>Notes</u>										
WBS Description:										
Preproduction version of Linker Module										
1.3.3.8.2.1	Modification of Schematic Design and Layout (FNAL)	\$4,650.00	\$4,650.00	\$0.00	0.5	0.5	0			
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>
12	MANDSPASSL	4,650	4,650	0 days	Thu 11/20/03	Thu 1/8/04	\$4,650.00	\$0.00	\$0.00	\$4,650.00
<u>Notes</u>										
WBS Description:										

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Modification of Schematic Design and Layout (FNAL)" continued

Notes

Modification of Schematic Design of Layout based on performance of prototype Linker Module PC board. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% - OSU Electrical Eng - 6 wks (120 hrs) @\$55/hr * 0.25 (Eng. labor reimbursment rate) = \$1650
50% - OSU Electrical Tech - 6 wks (120 hrs) @\$25/hr = \$3000

1.3.3.8.2.2	Modification of Schematic Design and Layout (OSU)	\$4,950.00	\$4,950.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	4,950	4,950	0 days	Thu 11/20/03	Thu 1/8/04	\$4,950.00	\$0.00	\$0.00	\$4,950.00

Notes

WBS Description:

Modification of Schematic Design of Layout based on performance of prototype Linker Module PC board. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

50% - OSU Electrical Eng - 6 wks (120 hrs) * 0.75 (INKIND Labor contribution) = \$4950

1.3.3.8.2.3	Preproduction Linker Module pc board fabrication	\$14,037.00	\$14,037.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	14,037	14,037	0 days	Fri 1/9/04	Fri 3/5/04	\$14,037.00	\$0.00	\$0.00	\$14,037.00

Notes

WBS Description:

Preproduction Linker Module PC board fabrication and stuffing.

M&S BOE:

Actual Costs of Run 2A Linker Boards and current quotes for new parts

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Preproduction Linker Module pc board fabrication" continued

Notes

2 Preproduction Linker Modules -
cost - \$14037 (same cost as prototypes)

Production quantity linker board cost

Linker System:

Major Components:

Altera Stratix: \$3300

Altera Flex 10K: \$1035

Secondary Components: \$ 384

PCB Fabrication: \$ 600

PCB Assembly: \$ 370

Total Cost/Board \$5689

Labor BOE: N/A

1.3.3.8.2.4 FPGA Firmware Refinement \$0.00 \$0.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	10%	72 hrs	0 days	Thu 11/20/03	Fri 4/2/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Definition:

Refinement of the FPGA firmware based on experience with prototype and preproduction boards.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

1.3.3.8.2.5 Preproduction Linker Module pc board testing \$800.00 \$800.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	200%	320 hrs	0 days	Mon 3/8/04	Fri 4/2/04	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	800	800	0 days	Mon 3/8/04	Fri 4/2/04	\$800.00	\$0.00	\$0.00	\$800.00

Notes

WBS Description:

Preproduction Linker Module PC board testing including full speed I/O

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
"Preproduction Linker Module pc board testing" continued							
<u>Notes</u>							
Labor BOE:							
Based on experience with Run 2A XFT							
20% - OSU Electrical Tech 4 wks (32 hrs) @\$25/hr = \$800							
1.3.3.8.2.6	Preproduction Linker Modules schedule contingency	\$0.00	\$0.00	\$0.00	0	0	0
1.3.3.8.3	Production Linker Modules	\$173,070.00	\$173,070.00	\$0.00	0	0	0
<u>Notes</u>							
WBS Description:							
Production version of Linker Modules.							
1.3.3.8.3.1	Production Readiness Review Linker Modules	\$0.00	\$0.00	\$0.00	0	0	0
<u>Notes</u>							
WBS Description:							
Production Readiness Review for Linker Module production							
M&S BOE: N/A							
Labor BOE: N/A							
Schedule BOE: lag of 175 days due to anticipated funding for FY2004							
1.3.3.8.3.3	Begin Production Linker Modules	\$0.00	\$0.00	\$0.00	0	0	2
<u>Notes</u>							
WBS Description:							
This milestone marks the beginning of production of the Linker Modules and comes after a successful Production readiness review.							
1.3.3.8.3.4	Production Linker Module pc board fabrication	\$170,670.00	\$170,670.00	\$0.00	0.3	0	0
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>	
10	MANDSPASS	170,670	170,670	0 days	Tue 12/14/04	Mon 3/28/05	
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	
10	MANDSPASS	170,670	\$170,670.00	\$0.00	\$0.00	\$170,670.00	

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Production Linker Module pc board fabrication" continued

Notes

WBS Description:

Production Linker Module PC Board fabrication and stuffing.

M&S BOE:

Actual Costs of Run 2A Linker Boards and current quotes for new parts.

Require 24 + (6 spares) Linker Modules Cost = \$170,670.00

Linker System:

Major Components:

Altera Stratix: \$3300

Altera Flex 10K: \$1035

Secondary Components: \$ 384

PCB Fabrication: \$ 600

PCB Assembly: \$ 370

Total Cost/Board \$5689

Labor BOE:

1.3.3.8.3.5	Production Linker Module pc board testing	\$2,400.00	\$2,400.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	200%	960 hrs	0 days	Tue 3/29/05	Tue 6/21/05	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	2,400	2,400	0 days	Tue 3/29/05	Tue 6/21/05	\$2,400.00	\$0.00	\$0.00	\$2,400.00

Notes

WBS Description:

Production Linker Module PC board checkout and final certification of boards prior to installation.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

20% - OSU Electrical Tech 12 wks (96 hrs) @\$25/hr = \$2400

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.9	Linker Output Module II	\$36,800.00	\$36,800.00	\$0.00	0	0	0

Notes

WBS Description:

Linker Output Module II captures the track list from Linker Modules and drives the data to the XTRP and the Stereo Association Module. We need 24 boards + 6 spares

1.3.3.9.1	Linker Output Module Schematic Design and Layout (FNAL)	\$4,650.00	\$4,650.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	4,650	4,650	0 days	Mon 4/26/04	Mon 6/7/04	\$4,650.00	\$0.00	\$0.00	\$4,650.00

Notes

WBS Description:

Linker Output Module Schematic Design and Layout. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE: Based on experience with Run 2A XFT

50% - OSU Electrical Eng - 6 wks (120 hrs) @\$55/hr * 0.25 (Eng labor reimbursment factor) = \$1650

50% - OSU Electrical Tech - 6 wks (120 hrs)@\$25/hr = \$3000

1.3.3.9.2	Linker Output Module Schematic Design and Layout (OSU)	\$4,950.00	\$4,950.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	4,950	4,950	0 days	Mon 4/26/04	Mon 6/7/04	\$4,950.00	\$0.00	\$0.00	\$4,950.00

Notes

WBS Description:

Linker Output Module Schematic Design and Layout. The In-Kind resources (money and /or labor) provided by OSU are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE: Based on experience with Run 2A XFT

50% - OSU Electrical Eng - 6 wks (120 hrs) @\$55/hr * 0.75 (INKIND Eng labor contrib factor) = \$4950

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.9.3	Linker Output Module Preproduction PC board Fabrication	\$2,000.00	\$2,000.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	2,000	2,000	0 days	Tue 6/8/04	Tue 7/20/04	\$2,000.00	\$0.00	\$0.00	\$2,000.00

Notes

WBS Description:

Linker Output Module Preproduction PC board fabrication and stuffing for 2 boards.

M&S BOE:

Actual Costs of Run 2A Linke boards and current quotes for new parts. Cost for two boards \$2000.

Labor BOE: N/A

1.3.3.9.4	PreProduction Link Output Module Preproduction board checkc	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	100%	160 hrs	0 days	Wed 7/21/04	Tue 8/17/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

M&S BOE:

Labor BOE:

1.3.3.9.5	Production Readiness Review Linker Output Module	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Definition:

Production Readiness Review for Linker Output Module.

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level			
1.3.3.9.6	Linker Output Module board Fabrication	\$24,000.00	\$24,000.00	\$0.00	0.3	0	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	24,000	24,000	0 days	Thu 8/19/04	Thu 11/11/04	\$24,000.00	\$0.00	\$0.00	\$24,000.00

Notes

WBS Description:

Linker Output Module PC board Fabrication.

M&S BOE:

Actual Costs of Run 2A Linker Output Module boards and current quotes for new parts. Cost includes PC board fabrication and stuffing - 24 boards + 6 spares - \$24,000 + contingency

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level			
1.3.3.9.7	Production Link Output Module board checkout	\$1,200.00	\$1,200.00	\$0.00	0	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	200%	480 hrs	0 days	Fri 11/12/04	Wed 12/29/04	\$0.00	\$0.00	\$0.00	\$0.00
12	MANDSPASSL	1,200	1,200	0 days	Fri 11/12/04	Wed 12/29/04	\$1,200.00	\$0.00	\$0.00	\$1,200.00

Notes

WBS Description:

Production Linker Output Module PC board checkout, including driving data at speed from the new Linker Module.

M&S BOE: N/A

Labor BOE:

Based on experience with Run 2A XFT

20% - OSU Electrical Tech 6 wks (48 hrs) @\$25/hr = \$1200

1.3.3.9.8	Linker Output Module II schedule contingency task	\$0.00	\$0.00	\$0.00	0	0	0
1.3.3.10	Stereo Association Modules	\$296,326.00	\$296,326.00	\$0.00	0	0	0

Notes

WBS Description:

The stereo association system associates axial XFT tracks with COT SL7 segments to produce 3D tracks in the trigger.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.10.1	Prototype Stereo Association Module (FNAL)	\$33,870.00	\$33,870.00	\$0.00	0	0	0

Notes
WBS Description:

Summary item for prototype stereo association module development.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.10.1.1	Prototype Stereo Association Module Schematic Design	\$6,510.00	\$6,510.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	6,510	6,510	0 days	Mon 3/4/02	Wed 11/6/02	\$6,510.00	\$0.00	\$0.00	\$6,510.00

Notes
WBS Description:

Schematic design of CDF XFT II Stereo Association Module (SAM). The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Engineering labor time estimated based upon design of CDF Run 2a XTRP and Track Trigger systems, which are similar in nature.

30% UIUC Electrical Eng - 35w (420h)@\$62/hr * 0.25 (Eng. Labor reimbursement rate) = \$6510

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.10.1.2	Prototype Stereo Association Module pc board layout	\$7,440.00	\$7,440.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	7,440	7,440	0 days	Fri 11/8/02	Mon 2/10/03	\$7,440.00	\$0.00	\$0.00	\$7,440.00

Notes
WBS Description:

Printed circuit board layout will proceed from the schematic. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Engineering labor is estimated based upon experience with the CDF Run 2a XTRP and Two Track Trigger systems.

100% UIUC Electrical Eng - 12w (480h)@\$62/hr * 0.25 (Eng. Labor reimbursement rate) = \$7440

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.10.1.3	Prototype Stereo Association Module Component procurement	\$0.00	\$0.00	\$0.00	0	0	0

Notes
WBS Description:

The procurement task for prototype stereo association module components. The component costs are listed in M&S BOE for

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Prototype Stereo Association Module Component procurement" continued

Notes

the Prototype Stereo Association Module pc board fabrication task

M&S BOE: N/A

Component cost shown in Bill-of-materials estimated from CDF Run 2a XTRP Databoard.

Labor BOE: N/A

1.3.3.10.1.4	Prototype Stereo Association Module pc board fabrication	\$10,000.00	\$10,000.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	10,000	10,000	0 days	Tue 2/25/03	Mon 4/21/03	\$10,000.00	\$0.00	\$0.00	\$10,000.00

Notes

WBS Description:

Fabrication of prototype boards.

M&S BOE: N/A

Cost estimate based upon fabrication and assembly of similar quantity of CDF Run 2a Two-track trigger boards. Cost as follows:

fabrication cost from Ambitech purchase order (2000):

4 boards = 8285.48 * 1.10 (inflation factor) = 9114.03

assembly cost from Mercury EMS-Iowa purchase order (2000):

2 boards = 1293.28 (assembly)+800(stencils)+1751.17(test fixture) = 3844.45

cost = 3844.45*1.10 (inflation factor) = 4228.90

total cost = 9114.03 + 4228.90 = 13342.93

estimate based upon previous experience and actual purchase orders => 30% contingency

Labor BOE: N/A

1.3.3.10.1.5	Prototype Stereo Association Module testing	\$9,920.00	\$9,920.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	9,920	9,920	0 days	Wed 9/24/03	Thu 2/19/04	\$9,920.00	\$0.00	\$0.00	\$9,920.00

Notes

WBS Description:

Prototype test and evaluation will be performed by combination of engineering and physicist labor. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Prototype Stereo Association Module testing" continued

Notes

Labor BOE:

Task duration (calendar time) estimated based upon time to debug and evaluate XTRP prototype databoards.

80% UIUC Electrical Eng - 20w (640h)@\$62/hr * 0.25 (Eng. Labor reimbursement rate) = \$9920

1.3.3.10.2	Prototype Stereo Association Module (ILL)	\$71,610.00	\$71,610.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary item for prototype stereo association module development.

1.3.3.10.2.1	Prototype Stereo Association Module Schematic Design	\$19,530.00	\$19,530.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	19,530	19,530	0 days	Mon 3/4/02	Wed 11/6/02	\$19,530.00	\$0.00	\$0.00	\$19,530.00

Notes

WBS Description:

Schematic design of CDF XFT II Stereo Association Module (SAM). The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Engineering labor time estimated based upon design of CDF Run 2a XTRP and Track Trigger systems, which are similar in nature.

30% UIUC Electrical Eng - 35w (420h)@\$62/hr * 0.75 (INKIND Eng. Labor Contribution rate) = \$19530

1.3.3.10.2.2	Prototype Stereo Association Module pc board layout	\$22,320.00	\$22,320.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	480 hrs	0 days	Fri 11/8/02	Mon 2/10/03	\$0.00	\$0.00	\$0.00	\$0.00
11	INKIND	22,320	22,320	0 days	Fri 11/8/02	Mon 2/10/03	\$22,320.00	\$0.00	\$0.00	\$22,320.00

Notes

WBS Description:

Printed circuit board layout will proceed from the schematic. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Prototype Stereo Association Module pc board layout" continued

Notes

Labor BOE:

Engineering labor is estimated based upon experience with the CDF Run 2a XTRP and Two Track Trigger systems.

100% UIUC Electrical Eng - 12w (480h)@\$62/hr * 0.75 (INKIND Eng. Labor Contribution rate) = \$22320

1.3.3.10.2.3	Prototype Stereo Association Module testing	\$29,760.00	\$29,760.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish
7	PostDocU	200%	1,600 hrs	0 days	Wed 9/24/03	Thu 2/19/04
11	INKIND	29,760	29,760	0 days	Wed 9/24/03	Thu 2/19/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	200%	\$0.00	\$0.00	\$0.00	\$0.00
11	INKIND	29,760	\$29,760.00	\$0.00	\$0.00	\$29,760.00

Notes

WBS Description:

Prototype test and evaluation will be performed by combination of engineering and physicist labor. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Task duration (calendar time) estimated based upon time to debug and evaluate XTRP prototype databoards.

80% UIUC Electrical Eng - 20w (640h)@\$62/hr * 0.75 (INKIND Eng. Labor Contribution rate) = \$29760

1.3.3.10.3	Preproduction Stereo Association Module	\$16,726.00	\$16,726.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task for preproduction SAM development.

1.3.3.10.3.1	Preproduction Readiness Review Stereo Association Module	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description:

Preproduction Readiness Review to sign off on prototype evaluation and prototype layout of the Stereo Association Modules.

M&S BOE: N/A

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.10.3.3	Begin Preproduction Stereo Association Modules	\$0.00	\$0.00	\$0.00	0	0	2

Notes

WBS Description:

Milestone marking the completion of the prototyping phase of the development of the Stereo Association Modules.

1.3.3.10.3.4	Modification of Schematic Design and Layout (FNAL)	\$744.00	\$744.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	744	744	0 days	Tue 6/22/04	Tue 8/3/04	\$744.00	\$0.00	\$0.00	\$744.00

Notes

WBS Description:

Modification of schematic design and layout based upon results of prototype testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Time based upon experience from Run 2a XTRP system.

20% - UIUC Electrical Eng. - 6 wks (48h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$744

1.3.3.10.3.5	Modification of Schematic Design and Layout (ILL)	\$2,232.00	\$2,232.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	2,232	2,232	0 days	Tue 6/22/04	Tue 8/3/04	\$2,232.00	\$0.00	\$0.00	\$2,232.00

Notes

WBS Description:

Modification of schematic design and layout based upon results of prototype testing. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Time based upon experience from Run 2a XTRP system.

20% - UIUC Electrical Eng. - 6 wks (48h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$2232

1.3.3.10.3.6	Preproduction Stereo Association Module component procurem	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS Description:

Components for preproduction SAM.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Preproduction Stereo Association Module component procurement" continued

Notes

M&S BOE: N/A
Parts cost same as listed for prototype SAM.

Labor BOE: N/A

1.3.3.10.3.7	Preproduction Stereo Association Module pc board fabrication	\$13,750.00	\$13,750.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish
10	MANDSPASS	13,750	13,750	0 days	Wed 8/18/04	Wed 10/13/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	13,750	\$13,750.00	\$0.00	\$0.00	\$13,750.00

Notes

WBS Description:

Fabrication of preproduction boards.

M&S BOE: N/A

Cost estimate based upon fabrication and assembly of similar quantity of CDF Run 2a Two-track trigger boards. Cost as follows:

fabrication cost from Ambitech purchase order (2000):

4 boards = 8285.48 * 1.10 (inflation factor) = 9114.03

assembly cost from Mercury EMS-Iowa purchase order (2000):

2 boards = 1293.28 (assembly)+800(stencils)+1751.17(test fixture) = 3844.45

cost = 3844.45*1.10 (inflation factor) = 4228.90

total cost = 9114.03 + 4228.90 = 13342.93

estimate based upon previous experience and actual purchase orders => 30% contingency

Labor BOE: N/A

1.3.3.10.3.8	Preproduction Stereo Association Module pc board testing	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	320 hrs	0 days	Thu 10/14/04	Fri 12/10/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Board checkout and debug.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Preproduction Stereo Association Module pc board testing" continued

Notes
M&S BOE: N/A

Labor BOE:
Time for this task based upon Preproduction Run 2a XTRP databoard checkout and test.

1.3.3.10.3.9	Preproduction Stereo Association Module schedule contingency	\$0.00	\$0.00	\$0.00	0	0	0
1.3.3.10.4	Production Stereo Association Module (FNAL)	\$133,080.00	\$133,080.00	\$0.00	0	0	0

Notes
WBS Description:

Summary task for SAM production run.

1.3.3.10.4.1	Modification of Schematic Design and Layout	\$1,240.00	\$1,240.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,240	1,240	0 days	Mon 12/13/04	Thu 1/13/05	\$1,240.00	\$0.00	\$0.00	\$1,240.00

Notes
WBS Description:

Modification of schematic design and layout based upon results of preproduction testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Time based upon experience from Run 2a XTRP system.

50% - UIUC Electrical Eng. - 4 wks (80h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$1240

1.3.3.10.4.2	Production Readiness Review Stereo Association Module	\$0.00	\$0.00	\$0.00	0	0	0
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Notes
WBS Description:

Review for production readiness.

M&S BOE: N/A

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.10.4.3	Production Stereo Association Module pc board fabrication	\$110,000.00	\$110,000.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
10	MANDSPASS	110,000	110,000	0 days	Tue 1/18/05	Mon 4/11/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	110,000	\$110,000.00	\$0.00	\$0.00	\$110,000.00

Notes

WBS Description:

Production run for SAM modules. Cost includes board fabrication, components and assembly.

M&S BOE: N/A

Cost estimate based upon fabrication of Run 2a XTRP databoard production run:

fabricate: \$25k (Ambitech P.O.)
 assemble: \$10k (Mercury P.O.)
 parts: \$85k (BOM)

Note that parts for XTRP databoard and SAMs are similar but not identical. Contingency on this item reflects uncertainty in board components.

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.10.4.4	Production Stereo Association Module pc board testing	\$21,840.00	\$21,840.00	\$0.00	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	21,840	21,840	0 days	Tue 4/12/05	Wed 7/6/05	\$21,840.00	\$0.00	\$0.00	\$21,840.00

Notes

WBS Description:

Test of production boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Checkout and testing time based upon Run 2a XTRP databoard experience.

100% - UIUC Electrical Tech - 12 wks (480h) @\$30/hr = \$14400
 100% - UIUC Electrical Eng. - 12 wks (480h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$7440

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.10.4.6	Production Stereo Association Modules complete	\$0.00	\$0.00	\$0.00	0	0	2

Notes

Description

Milestone denoting the completion of the Stereo Association Modules.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.10.5	Production Stereo Association Module (ILL)	\$26,040.00	\$26,040.00	\$0.00	0	0	0

Notes
WBS Description:
Summary task for SAM production run.

1.3.3.10.5.1	Modification of Schematic Design and Layout	\$3,720.00	\$3,720.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	3,720	3,720	0 days	Mon 12/13/04	Thu 1/13/05	\$3,720.00	\$0.00	\$0.00	\$3,720.00

Notes
WBS Description:

Modification of schematic design and layout based upon results of preproduction testing. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Time based upon experience from Run 2a XTRP system.

50% - UIUC Electrical Eng. - 4 wks (80h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$3720

1.3.3.10.5.2	Production Stereo Association Module pc board testing	\$22,320.00	\$22,320.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	200%	960 hrs	0 days	Tue 4/12/05	Wed 7/6/05	\$0.00	\$0.00	\$0.00	\$0.00
11	INKIND	22,320	22,320	0 days	Tue 4/12/05	Wed 7/6/05	\$22,320.00	\$0.00	\$0.00	\$22,320.00

Notes
WBS Description:

Test of production boards. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Checkout and testing time based upon Run 2a XTRP databoard experience.

100% - UIUC Electrical Eng. - 12 wks (480h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$22320

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.3.10.6	Purchase VME crate	\$15,000.00	\$15,000.00	\$0.00	0.5	0	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	15,000	15,000	0 days	Fri 1/3/03	Fri 1/31/03	\$15,000.00	\$0.00	\$0.00	\$15,000.00

Notes

WBS Description:
Purchase a VME crate for the Stereo Association Module for use during testing at U of Ill.

M&S BOE:

Cost based upon CDF Run2a VME crate purchases. Includes power supplies.

Labor BOE: N/A

1.3.3.11	Stereo Association Module Custom Backplane (FNAL)	\$11,540.00	\$11,540.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task for SAM custom backplane.

1.3.3.11.1	Stereo Assoc. Module Custom Backplane Schematic design	\$744.00	\$744.00	\$0.00	0.5	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	744	744	0 days	Thu 1/9/03	Thu 4/3/03	\$744.00	\$0.00	\$0.00	\$744.00

Notes

WBS Description:

Schematic depends upon SAM signal routing and detector geometry. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Estimate based upon custom XTRP backplane developed in Run 2a.

10% - UIUC Electrical Eng. - 12 wks (48h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$744

1.3.3.11.2	Stereo Association Module Backplane layout	\$372.00	\$372.00	\$0.00	0.5	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	372	372	0 days	Fri 4/4/03	Fri 6/27/03	\$372.00	\$0.00	\$0.00	\$372.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Stereo Association Module Backplane layout" continued

Notes

Task will be performed in parallel with SAM design. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Estimate based upon custom XTRP backplane developed in Run 2a.

5% - UIUC Electrical Eng. - 12 wks (24h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$372

1.3.3.11.3	Stereo Association Module Backplane fabrication	\$10,000.00	\$10,000.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	10,000	10,000	0 days	Mon 6/30/03	Mon 7/28/03	\$10,000.00	\$0.00	\$0.00	\$10,000.00

Notes

WBS Description:

Backplane fabrication.

M&S BOE: N/A

Cost of backplane estimated from custom backplanes produced for the CDF Run 2a XTRP project. The cost to construct four backplanes was $4251.12 * 1.10(\text{inflation}) = 4676.32 + \300 in non-connector components.

Labor BOE: N/A

1.3.3.11.4	Stereo Association Module Backplane assembly	\$300.00	\$300.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	300	300	0 days	Tue 7/29/03	Mon 8/4/03	\$300.00	\$0.00	\$0.00	\$300.00

Notes

WBS Description:

Backplane assembly consists of connectors and a modest number of termination resistors.

M&S BOE: N/A

Labor BOE:

Estimate based upon custom XTRP backplane developed in Run 2a.

25% - UIUC Electrical Tech. - 1 wk (10hrs) @\$30/hr = \$300

WBS	Name					Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.3.11.5	Stereo Association Module Backplane testing					\$124.00	\$124.00	\$0.00	0.5	0.5	0
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	
12	MANDSPASSL	124	124	0 days	Tue 8/5/03	Tue 9/2/03	\$124.00	\$0.00	\$0.00	\$124.00	

Notes

WBS Description:

Backplane testing happens in conjunction with prototype SAM testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Estimate based upon custom XTRP backplane developed in Run 2a.

5% - UIUC Electrical Eng. - 4 wks (8h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$124

1.3.3.11.6	Stereo Assoc. Module Custom Backplane schedule contingency					\$0.00	\$0.00	\$0.00	0	0	0
1.3.3.12	Stereo Association Module Custom Backplane (ILL)					\$3,720.00	\$3,720.00	\$0.00	0	0	0

Notes

WBS Description:

Summary task for SAM custom backplane.

1.3.3.12.1	Stereo Assoc. Module Custom Backplane Schematic design					\$2,232.00	\$2,232.00	\$0.00	0.5	0.5	0
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	
11	INKIND	2,232	2,232	0 days	Thu 1/9/03	Thu 4/3/03	\$2,232.00	\$0.00	\$0.00	\$2,232.00	

Notes

WBS Description:

Schematic depends upon SAM signal routing and detector geometry. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Estimate based upon custom XTRP backplane developed in Run 2a.

10% - UIUC Electrical Eng. - 12 wks (48h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$2232

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.3.12.2	Stereo Association Module Backplane layout	\$1,116.00	\$1,116.00	\$0.00	0.5	0.5	0			
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>
7	PostDocU	5%	24 hrs	0 days	Fri 4/4/03	Fri 6/27/03	\$0.00	\$0.00	\$0.00	\$0.00
11	INKIND	1,116	1,116	0 days	Fri 4/4/03	Fri 6/27/03	\$1,116.00	\$0.00	\$0.00	\$1,116.00

Notes
WBS Description:

Task will be performed in parallel with SAM design. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Estimate based upon custom XTRP backplane developed in Run 2a.

5% - UIUC Electrical Eng. - 12 wks (24h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$1116

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.3.12.3	Stereo Association Module Backplane testing	\$372.00	\$372.00	\$0.00	0.5	0.5	0			
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>
7	PostDocU	10%	16 hrs	0 days	Tue 8/5/03	Tue 9/2/03	\$0.00	\$0.00	\$0.00	\$0.00
11	INKIND	372	372	0 days	Tue 8/5/03	Tue 9/2/03	\$372.00	\$0.00	\$0.00	\$372.00

Notes
WBS Description:

Backplane testing happens in conjunction with prototype SAM testing. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Estimate based upon custom XTRP backplane developed in Run 2a.

5% - UIUC Electrical Eng. - 4 wks (8h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$372

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.13	Stereo Association Module Tester Board (FNAL)	\$28,888.00	\$28,888.00	\$0.00	0	0	0

Notes
WBS Description:

Summary task for SAM tester board. Tester board serves as both data source and sync, allowing SAM testing at full clock speed for a large number of events.

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost		
1.3.3.13.1	Stereo Association Module Tester Board schematic design						\$2,976.00	\$2,976.00	\$0.00	0.5	0.5	0
12	MANDSPASSL	2,976	2,976	0 days	Fri 4/4/03	Mon 7/28/03	\$2,976.00	\$0.00	\$0.00	\$2,976.00		

Notes
WBS Description:

Schematic design of SAM tester board will occur in conjunction with SAM board design. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Time estimate based upon working knowledge of similar test setup utilized in the Run 2a XFT system. The Run 2a XFT test board, known as a LinkerTester, was utilized in the Run 2a XFT and XTRP test and commissioning phases.

30% - UIUC Electrical Eng. - 16 wks (8h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$2976

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost		
1.3.3.13.2	Stereo Association Module Tester Board layout						\$3,472.00	\$3,472.00	\$0.00	0.5	0.5	0
12	MANDSPASSL	3,472	3,472	0 days	Tue 7/29/03	Tue 9/23/03	\$3,472.00	\$0.00	\$0.00	\$3,472.00		

Notes
WBS Description:

Layout of the SAM tester board. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Layout time estimate based upon experience with boards of similar complexity. This will occur in parallel with backplane layout.

70% - UIUC Electrical Eng. - 8 wks (224h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$3472

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.3.13.3	Stereo Association Module Tester Board Fabrication	\$15,000.00	\$15,000.00	\$0.00	0.3	0	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	15,000	15,000	0 days	Wed 9/24/03	Tue 11/18/03	\$15,000.00	\$0.00	\$0.00	\$15,000.00

Notes

WBS Description:

SAM Tester board fabrication, assembly and components. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Cost estimated based upon previously fabricated prototype boards of similar complexity. See for example the prototype SAM board.

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.3.13.4	Stereo Association Module TestStand Setup and software	\$1,240.00	\$1,240.00	\$0.00	0.5	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,240	1,240	0 days	Wed 9/24/03	Thu 2/19/04	\$1,240.00	\$0.00	\$0.00	\$1,240.00

Notes

WBS Description:

Development of test stand software will be performed mostly by physicists. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

The time and manpower estimates are based upon experience with the Run 2a XTRP system. In this task, engineering resources are only utilized in consultation.

10% - UIUC Electrical Eng. - 20 wks (80h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$1240

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level			
1.3.3.13.5	Stereo Association Module Tester Board testing	\$6,200.00	\$6,200.00	\$0.00	0.5	0.5	0			
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	6,200	6,200	0 days	Fri 2/20/04	Thu 4/29/04	\$6,200.00	\$0.00	\$0.00	\$6,200.00

Notes

WBS Description:

SAM Tester Board testing occurs in parallel with the testing of the SAM and backplane. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Stereo Association Module Tester Board testing" continued

Notes

M&S BOE: N/A

Labor BOE:

Manpower estimates based upon experience with the Run 2a XTRP system.

100% - UIUC Electrical Eng. - 10 wks (400h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$6200

1.3.3.14	Stereo Association Module Tester Board (ILL)	\$41,664.00	\$41,664.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task for SAM tester board. Tester board serves as both data source and sync, allowing SAM testing at full clock speed for a large number of events.

1.3.3.14.1	Stereo Association Module Tester Board schematic design	\$8,928.00	\$8,928.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	8,928	8,928	0 days	Fri 4/4/03	Mon 7/28/03	\$8,928.00	\$0.00	\$0.00	\$8,928.00

Notes

WBS Description:

Schematic design of SAM tester board will occur in conjunction with SAM board design. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Time estimate based upon working knowledge of similar test setup utilized in the Run 2a XFT system. The Run 2a XFT test board, known as a LinkerTester, was utilized in the Run 2a XFT and XTRP test and commissioning phases.

5% - UIUC Electrical Eng. - 16 wks (192h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$8928

1.3.3.14.2	Stereo Association Module Tester Board layout	\$10,416.00	\$10,416.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	64 hrs	0 days	Tue 7/29/03	Tue 9/23/03	\$0.00	\$0.00	\$0.00	\$0.00
11	INKIND	10,416	10,416	0 days	Tue 7/29/03	Tue 9/23/03	\$10,416.00	\$0.00	\$0.00	\$10,416.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Stereo Association Module Tester Board layout" continued

Notes

Layout of the SAM tester board. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Layout time estimate based upon experience with boards of similar complexity. This will occur in parallel with backplane layout.

70% - UIUC Electrical Eng. - 8 wks (224h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$10416

1.3.3.14.3 Stereo Association Module TestStand Setup and software \$3,720.00 \$3,720.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	200%	1,600 hrs	0 days	Wed 9/24/03	Thu 2/19/04	\$0.00	\$0.00	\$0.00	\$0.00
11	INKIND	3,720	3,720	0 days	Wed 9/24/03	Thu 2/19/04	\$3,720.00	\$0.00	\$0.00	\$3,720.00

Notes

WBS Description:

Development of test stand software will be performed mostly by physicists. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

The time and manpower estimates are based upon experience with the Run 2a XTRP system. In this task, engineering resources are only utilized in consultation.

10% - UIUC Electrical Eng. - 20 wks (80h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$3720

1.3.3.14.4 Stereo Association Module Tester Board testing \$18,600.00 \$18,600.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	200%	800 hrs	0 days	Fri 2/20/04	Thu 4/29/04	\$0.00	\$0.00	\$0.00	\$0.00
11	INKIND	18,600	18,600	0 days	Fri 2/20/04	Thu 4/29/04	\$18,600.00	\$0.00	\$0.00	\$18,600.00

Notes

WBS Description:

SAM Tester Board testing occurs in parallel with the testing of the SAM and backplane. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Stereo Association Module Tester Board testing" continued

Notes
M&S BOE: N/A

Labor BOE:
Manpower estimates based upon experience with the Run 2a XTRP system.

100% - UIUC Electrical Eng. - 10 wks (400h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$18,600

1.3.3.15	Stereo Association Module Transition Module (FNAL)	\$16,054.00	\$16,054.00	\$0.00	0	0	0
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Notes
WBS Description:

Summary task for SAM transition module.

1.3.3.15.1	Stereo Association Module Transition Module Schematic design	\$744.00	\$744.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	744	744	0 days	Mon 5/12/03	Tue 8/5/03	\$744.00	\$0.00	\$0.00	\$744.00

Notes
WBS Description:

Transition board design will proceed in parallel with SAM development.
Task start time determined by the need to finalize digital link specifications. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Actual schematic development time is based upon Run 2a XTRP databoard transition module development time.

10% - UIUC Electrical Eng. - 12 wks (48h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$744

1.3.3.15.2	Stereo Association Module Transition Module layout	\$310.00	\$310.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	310	310	0 days	Wed 8/6/03	Wed 9/10/03	\$310.00	\$0.00	\$0.00	\$310.00

Notes
WBS Description:

Transition module layout to be performed by a physicist in consultation with an engineer. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Stereo Association Module Transition Module layout" continued

Notes

M&S BOE: N/A

Labor BOE:

Actual layout time is based upon Run 2a XTRP databoard transition module development time.

10% - UIUC Electrical Eng. - 5 wks (20h) @\$62/hr * 0.25 (Eng. labor reimbursment rate) = \$310

1.3.3.15.3	Stereo Association Module Transition Module fabrication	\$15,000.00	\$15,000.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	15,000	15,000	0 days	Thu 9/11/03	Wed 11/5/03	\$15,000.00	\$0.00	\$0.00	\$15,000.00

Notes

WBS Description:

SAM transition module fabrication, including components and assembly.

M&S BOE: N/A

Cost estimated from Run 2a XTRP databoard transition module. Purchase order from ADCO Circuits attached includes fabrication, parts and assembly.

Labor BOE:

1.3.3.15.4	Stereo Association Module Transition Module testing	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	240 hrs	0 days	Thu 11/6/03	Fri 12/19/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Transition module testing will follow SAM prototype testing.

M&S BOE: N/A

Labor BOE:

Time estimated from Run 2a XTRP databoard transition module testing.

1.3.3.15.5	Stereo Assoc. Module Transition Module schedule contingency	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.3.16	Stereo Association Module Transition Module (ILL)	\$3,162.00	\$3,162.00	\$0.00	0	0	0
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Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Stereo Association Module Transition Module (ILL)" continued

Notes

Summary task for SAM transition module.

1.3.3.16.1 Stereo Association Module Transition Module Schematic design \$2,232.00 \$2,232.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	2,232	2,232	0 days	Mon 5/12/03	Tue 8/5/03	\$2,232.00	\$0.00	\$0.00	\$2,232.00

Notes

WBS Description:

Transition board design will proceed in parallel with SAM development.

Task start time determined by the need to finalize digital link specifications. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Actual schematic development time is based upon Run 2a XTRP databoard transition module development time.

10% - UIUC Electrical Eng. - 12 wks (48h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$2232

1.3.3.16.2 Stereo Association Module Transition Module layout \$930.00 \$930.00 \$0.00 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	200 hrs	0 days	Wed 8/6/03	Wed 9/10/03	\$0.00	\$0.00	\$0.00	\$0.00
11	INKIND	930	930	0 days	Wed 8/6/03	Wed 9/10/03	\$930.00	\$0.00	\$0.00	\$930.00

Notes

WBS Description:

Transition module layout to be performed by a physicist in consultation with an engineer. . The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Actual layout time is based upon Run 2a XTRP databoard transition module development time.

10% - UIUC Electrical Eng. - 5 wks (20h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$930

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.17	Stereo Association Module Clock and Control Board (FNAL	\$13,348.00	\$13,348.00	\$0.00	0	0	0

Notes
WBS Description:

Summary task for SAM Clock and Control board.

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost		
1.3.3.17.1	Stereo Association Module Clock and Control Board Schematic						\$1,488.00	\$1,488.00	\$0.00	0.5	0.5	0
12	MANDSPASSL	1,488	1,488	0 days	Tue 6/3/03	Tue 8/26/03	\$1,488.00	\$0.00	\$0.00	\$1,488.00		

Notes
WBS Description:

SAM Clock and Control Module layout will proceed in parallel with other elements of the project. Design will be very similar to Run 2a XTRP Clock and Control Module. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Schematic development time estimated from the Run 2a system.

20% - UIUC Electrical Eng. - 12 wks (96h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$1488

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost		
1.3.3.17.2	Stereo Association Module Clock and Control Board Layout						\$1,860.00	\$1,860.00	\$0.00	0.5	0.5	0
12	MANDSPASSL	1,860	1,860	0 days	Wed 8/27/03	Wed 10/8/03	\$1,860.00	\$0.00	\$0.00	\$1,860.00		

Notes
WBS Description:

Layout of the SAM Clock & control board. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Time estimated from Run 2a XTRP Clock and Control system.

50% - UIUC Electrical Eng. - 6 wks (120h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$1860

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.3.17.3	Stereo Association Module Clock and Control Board Fabrication	\$10,000.00	\$10,000.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	10,000	10,000	0 days	Thu 10/9/03	Wed 11/26/03	\$10,000.00	\$0.00	\$0.00	\$10,000.00

Notes

WBS Description:

Fabrication cost includes assembly and components.

M&S BOE: N/A

Labor BOE:

Cost based upon fabrication of Run 2a XTRP Clock and Control module. This task includes board fabrication, parts and assembly. Cost of \$19k from purchase order of Run 2a assembled boards.

1.3.3.17.4	Stereo Association Module Clock and Control Board testing	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	160 hrs	0 days	Mon 12/1/03	Tue 12/30/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Testing will begin in parallel with with prototype/preproduction SAM testing.

M&S BOE: N/A

Labor BOE:

Time estimated from Run 2a XTRP Clock and Control system.

1.3.3.17.5	Stereo Assoc. Module Clock and Control board schedule contin	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.3.18	Stereo Association Module Clock and Control Board (ILL)	\$10,044.00	\$10,044.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task for SAM Clock and Control board.

1.3.3.18.1	Stereo Association Module Clock and Control Board Schematic	\$4,464.00	\$4,464.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	4,464	4,464	0 days	Tue 6/3/03	Tue 8/26/03	\$4,464.00	\$0.00	\$0.00	\$4,464.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Stereo Association Module Clock and Control Board Schematic Design" continued

Notes

SAM Clock and Control Module layout will proceed in parallel with other elements of the project. Design will be very similar to Run 2a XTRP Clock and Control Module. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Schematic development time estimated from the Run 2a system.

20% - UIUC Electrical Eng. - 12 wks (96h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$4464

1.3.3.18.2	Stereo Association Module Clock and Control Board Layout	\$5,580.00	\$5,580.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	240 hrs	0 days	Wed 8/27/03	Wed 10/8/03	\$0.00	\$0.00	\$0.00	\$0.00
11	INKIND	5,580	5,580	0 days	Wed 8/27/03	Wed 10/8/03	\$5,580.00	\$0.00	\$0.00	\$5,580.00

Notes

WBS Description:

Layout of the SAM Clock & control board. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Time estimated from Run 2a XTRP Clock and Control system.

50% - UIUC Electrical Eng. - 6 wks (120h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$5580

1.3.3.19	SAM Clock and Control Transition Module (FNAL)	\$13,348.00	\$13,348.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task for SAM clock and control transition module.

1.3.3.19.1	SAM Clock and Control TM Schematic Design	\$1,488.00	\$1,488.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,488	1,488	0 days	Tue 6/3/03	Tue 8/26/03	\$1,488.00	\$0.00	\$0.00	\$1,488.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"SAM Clock and Control TM Schematic Design" continued

Notes

SAM Clock and Control Transition Module layout will proceed in parallel with other elements of the project. Design will be very similar to Run 2a XTRP Clock and Control TM. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Schematic development time estimated from the Run 2a system.

20% - UIUC Electrical Eng. - 12 wks (96h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$1488

1.3.3.19.2	SAM Clock and Control TM Layout	\$1,860.00	\$1,860.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,860	1,860	0 days	Wed 8/27/03	Wed 10/8/03	\$1,860.00	\$0.00	\$0.00	\$1,860.00

Notes

WBS Description:

SAM clock and control TM layout. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Time estimated from Run 2a XTRP Clock and Control system.

50% - UIUC Electrical Eng. - 6 wks (120h) @\$62/hr * 0.25 (Eng. labor reimbursement rate) = \$1860

1.3.3.19.3	SAM Clock and Control TM Fabrication	\$10,000.00	\$10,000.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	10,000	10,000	0 days	Thu 10/9/03	Wed 11/26/03	\$10,000.00	\$0.00	\$0.00	\$10,000.00

Notes

WBS Description:

Fabrication.

M&S BOE: N/A

Cost based upon fabrication of Run 2a XTRP Clock and Control module. This task includes board fabrication, parts and assembly. Cost of \$2.5k from purchase order of Run 2a bare boards. Parts and assembly performed in-house.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"SAM Clock and Control TM Fabrication" continued

Notes

Labor BOE: N/A

1.3.3.19.4	SAM Clock and Control TM testing	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	160 hrs	0 days	Mon 12/1/03	Tue 12/30/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Testing will begin in parallel with with prototype/preproduction SAM TM testing.

M&S BOE: N/A

Labor BOE:

Time estimated from Run 2a XTRP clock and control transition module testing.

1.3.3.19.5	SAM Clock and Control Transition Module schedule contingenc	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.3.20	SAM Clock and Control Transition Module (ILL)	\$10,044.00	\$10,044.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task for SAM clock and control transition module.

1.3.3.20.1	SAM Clock and Control TM Schematic Design	\$4,464.00	\$4,464.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	4,464	4,464	0 days	Tue 6/3/03	Tue 8/26/03	\$4,464.00	\$0.00	\$0.00	\$4,464.00

Notes

WBS Description:

SAM Clock and Control Transition Module layout will proceed in parallel with other elements of the project. Design will be very similar to Run 2a XTRP Clock and Control TM. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Schematic development time estimated from the Run 2a system.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"SAM Clock and Control TM Schematic Design" continued

Notes

20% - UIUC Electrical Eng. - 12 wks (96h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$4464

1.3.3.20.2	SAM Clock and Control TM Layout	\$5,580.00	\$5,580.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	240 hrs	0 days	Wed 8/27/03	Wed 10/8/03	\$0.00	\$0.00	\$0.00	\$0.00
11	INKIND	5,580	5,580	0 days	Wed 8/27/03	Wed 10/8/03	\$5,580.00	\$0.00	\$0.00	\$5,580.00

Notes

WBS Description:

SAM clock and control TM layout. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Time estimated from Run 2a XTRP Clock and Control system.

50% - UIUC Electrical Eng. - 6 wks (120h) @\$62/hr * 0.75 (INKIND Eng. Labor contribution factor) = \$5580

1.3.3.21	Level 2 Interface Board	\$47,280.00	\$47,280.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task for XFT-> Level 2 interface board.

1.3.3.21.1	Level 2 Interface Board Schematic and PCB Layout (ILL)	\$14,880.00	\$14,880.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	14,880	14,880	0 days	Fri 1/2/04	Fri 2/27/04	\$14,880.00	\$0.00	\$0.00	\$14,880.00

Notes

WBS Description:

Exact design will await specifications of the Run 2b Level 2 trigger system. Format will be quite similar to the Run 2a Level 2 interface, but exact digital links are yet to be specified. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Level 2 Interface Board Schematic and PCB Layout (ILL)" continued

Notes

Time estimate based upon Run 2a XTRP/L2 interface.

100% UIUC Electrical Eng - 8w (320h)@\$62/hr * 0.75 (INKIND Eng. Labor Contribution rate) = \$14880

1.3.3.21.2	Level 2 Interface Board Schematic and PCB Layout (FNAL)	\$4,960.00	\$4,960.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	4,960	4,960	0 days	Fri 1/2/04	Fri 2/27/04	\$4,960.00	\$0.00	\$0.00	\$4,960.00

Notes

WBS Description:

Exact design will await specifications of the Run 2b Level 2 trigger system. Format will be quite similar to the Run 2a Level 2 interface, but exact digital links are yet to be specified. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Time estimate based upon Run 2a XTRP/L2 interface.

100% UIUC Electrical Eng - 8w (320h)@\$62/hr * 0.25 (Eng. Labor reimbursement rate) = \$4960

1.3.3.21.3	Prototype Level 2 Interface Board fabrication and testing	\$5,000.00	\$5,000.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	5,000	5,000	0 days	Mon 3/1/04	Fri 4/23/04	\$5,000.00	\$0.00	\$0.00	\$5,000.00

Notes

WBS Description:

Prototype L2 interface board.

M&S BOE: N/A

Physicist estimate.

Labor BOE: N/A

1.3.3.21.4	Modification Level 2 Interface Board Schematic and PCB Layout	\$5,580.00	\$5,580.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	5,580	5,580	0 days	Mon 4/26/04	Fri 5/14/04	\$5,580.00	\$0.00	\$0.00	\$5,580.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
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"Modification Level 2 Interface Board Schematic and PCB Layout (ILL)" continued

Notes

Schematic modification based upon results of prototype tests. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Physicist's estimate.

100% UIUC Electrical Eng - 3w (120h)@\$62/hr * 0.75 (INKIND Eng. Labor Contribution rate) = \$5580

1.3.3.21.5	Modification Level 2 Interface Board Schematic and PCB Layout	\$1,860.00	\$1,860.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,860	1,860	0 days	Mon 4/26/04	Fri 5/14/04	\$1,860.00	\$0.00	\$0.00	\$1,860.00

Notes

WBS Description:

Schematic modification based upon results of prototype tests. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Physicist's estimate.

100% UIUC Electrical Eng - 3w (120h)@\$62/hr * 0.25 (Eng. Labor reimbursement rate) = \$1860

1.3.3.21.6	Production Level 2 Interface Board Fabrication and assembly	\$15,000.00	\$15,000.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	15,000	15,000	0 days	Mon 5/17/04	Tue 7/13/04	\$15,000.00	\$0.00	\$0.00	\$15,000.00

Notes

WBS Description:

Production run.

M&S BOE: N/A
Cost is physicist's estimate.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Production Level 2 Interface Board Fabrication and assembly" continued

Notes

Labor BOE: N/A

1.3.3.21.7	Level 2 Interface Board checkout	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	100%	320 hrs	0 days	Wed 7/14/04	Wed 9/8/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Time to install and check out Level 2 interface board. Will be performed in conjunction with Level 2 system testing.

M&S BOE: N/A

Labor BOE:

Physicist's estimate.

1.3.3.23	XFT Ready for Installation at CDF	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

Milestone indicating XFT project complete.

1.3.4	Event-Builder Upgrade	\$414,000.00	\$414,000.00	\$0.00	0	0	0
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Notes

WBS Description:

This summary element covers the Event-Builder upgrade. It includes the complete software development, the construction of a prototype and the construction of the full system.

M&S BOE -

The details of the purchase and all parts are assumed to be equal to the purchase of the present Event Builder hardware. According to somewhat outdated quotes the hardware costs about 500k.

Contingency is included in the sense that these are old quotes and the hardware will only become cheaper, although not by much.

Further Details on the Hardware from a quote from December 2001

Raw cost

32 port ASX 4000 (Marconi)	\$215k
16 OC12 PCI cards (ForeRunnerHE 622)	\$30k
15 OC-12 PMC cards (Cyclonwe PMC59)	\$60k

Total	\$305k
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Spares

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Event-Builder Upgrade" continued

Notes

1 Spare switch backbone	\$51k
1 Spare switch module	\$40k
3 Spare PCI cards	\$6k
3 Spare ATM cards	\$12k
Total	\$109k

Total including spares	\$414k
Including 30% contingency	\$538k

1.3.4.1	Start Event-Builder Upgrade	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

This milestone marks the beginning date for work on the upgrade of the Event-Builder.

1.3.4.2	technology evaluation	\$0.00	\$0.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	40%	384 hrs	0 days	Wed 10/30/02	Thu 4/24/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Before starting to buy a prototype system an evaluation of the present technology will be performed. This evaluation results in the purchase of a prototype which is the most promising technology. The further schedule has been designed to fit the schedule for an upgrade using more powerful successor of the ATM technology. In case a different technology is chosen the schedule should still be appropriate. The price for the ATM technology is almost certainly higher than an alternative technology like Gigabit Ethernet.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.4.3	upgrade software	\$0.00	\$0.00	\$0.00	0	0	0
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Notes

WBS description:

This summary element covers the software development for the Event-Builder upgrade. It includes an evaluation of the operating system and the associated driver, the work needed for adjusting the drivers and the remaining software.

1.3.4.3.1	decide on the OS versions	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
3	CompProfF	0%	0 hrs	0 days	Fri 11/21/03	Fri 11/21/03	\$0.00	\$0.00	\$0.00	\$0.00
7	PostDocU	50%	40 hrs	0 days	Mon 11/24/03	Tue 12/9/03	\$0.00	\$0.00	\$0.00	\$0.00

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"decide on the OS versions" continued

Notes

WBS description:

The decision on the version of the operating system is important since it involves a number of tests. The operation system should be as recent as possible but it has to be well established since errors can be fatal. Drivers are dependent on the version of the operating system and upgrades usually involve extra work.

M/S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.4.3.2	test available drivers for compatibility with hardware	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
3	CompProfF	0%	0 hrs	0 days	Tue 12/9/03	Tue 12/9/03	\$0.00	\$0.00	\$0.00	\$0.00
7	PostDocU	20%	24 hrs	0 days	Wed 12/10/03	Mon 1/5/04	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	120 hrs	0 days	Wed 12/10/03	Mon 1/5/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Drivers for ATM network cards on the VxWorks and the Linux side are no commodity components so careful tests are necessary. Usually modifications are necessary or other drivers have to be identified.

M/S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.4.3.3	adjust drivers for special needs	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
3	CompProfF	0%	0 hrs	0 days	Mon 1/5/04	Mon 1/5/04	\$0.00	\$0.00	\$0.00	\$0.00
7	PostDocU	20%	208 hrs	0 days	Tue 1/6/04	Thu 7/8/04	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	1,040 hrs	0 days	Tue 1/6/04	Thu 7/8/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Since the ATM network switches are not used in general for the application described here modifications to the drivers are almost certainly necessary. In particular the driver on the VxWorks side needs work to optimize the data throughput.

M/S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"adjust drivers for special needs" continued

Notes

1.3.4.3.4 adjust remaining software \$0.00 \$0.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
3	CompProfF	0%	0 hrs	0 days	Thu 7/8/04	Thu 7/8/04	\$0.00	\$0.00	\$0.00	\$0.00
7	PostDocU	20%	8 hrs	0 days	Fri 7/9/04	Thu 7/15/04	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	40 hrs	0 days	Fri 7/9/04	Thu 7/15/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

Although the remaining software should to the largest part be independent of then drivers implementation the new drivers might reveal new features in the existing code. Time for adjusting the remaining software is included in this task.

M/S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.4.3.5 MS: establish general functionality of software \$0.00 \$0.00 \$0.00 0 0 3

Notes

WBS Description:

This milestone marks the end of the software development. At this point we intent to freeze the development and move the code to the maintenance phase. During the commissioning further problems might be spotted but the core development is finished at this point. Establishing the general functionality is not necessarily connected to tests with real data. Two more month until the end of the Event-Builder upgrade leave time for this last test.

1.3.4.4 **construct prototype** **\$103,500.00** **\$103,500.00** **\$0.00** **0** **0** **0**

Notes

WBS Description:

This summary element covers the construction of a prototype. It includes the purchase of the necessary elements, the installation and evaluation of a test stand.

The cost is based on a quote from a possible vendor in December 2001.

1.3.4.4.1 **purchase prototype system (1/4)** **\$103,500.00** **\$103,500.00** **\$0.00** **0** **0** **0**

Notes

WBS Description:

This summary task covers the purchase of the prototype system. It includes the submission of the PO and the implementation plan, the purchase formalities and the arrival of the hardware.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.4.4.1.1	submit PO and implementation plan	\$0.00	\$0.00	\$0.00	0	0	3

Notes

WBS Description:

The submission of the purchase order and the implementation plan is a milestone.

1.3.4.4.1.2	purchase formalities	\$103,500.00	\$103,500.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish
9	MANDS	103,500	103,500	0 days	Thu 3/11/04	Thu 6/3/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	103,500	\$103,500.00	\$0.00	\$0.00	\$103,500.00

Notes

WBS Description:

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.

M/S BOE:

Vendor quote December 2001

Labor BOE: N/A

1.3.4.4.1.4	arrival of the hardware	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the test system installation.

1.3.4.4.1.5	EVb Construct prototype schedule contingency	\$0.00	\$0.00	\$0.00	0	0	0
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1.3.4.4.2	install test stand	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	8 hrs	0 days	Fri 6/4/04	Thu 6/10/04	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	40 hrs	0 days	Fri 6/4/04	Thu 6/10/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

The installation of the goes quick since the environment is prepared.

M/S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"install test stand" continued

Notes

1.3.4.4.3 evaluate test stand \$0.00 \$0.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	16 hrs	0 days	Fri 6/11/04	Thu 6/24/04	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	80 hrs	0 days	Fri 6/11/04	Thu 6/24/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

The evaluation of the test stand is meant to establish the technical functionality of the hardware. Potential problems might require change of equipment.

M/S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.4.4.4 MS: establish functionality of hardware \$0.00 \$0.00 \$0.00 0 0 3

Notes

WBS Description:

Establishing the hardware functionality of the test system is a milestone and marks the point when the complete system should be purchased.

1.3.4.5 construct full size system \$310,500.00 \$310,500.00 \$0.00 0 0 0

Notes

WBS Description:

This summary element covers the construction of the full size Event-Builder system. It includes a readiness review, the purchase, installation and evaluation of the hardware and finally the completion of the system.

M&S BOE:

The cost is based on a quote by a possible vendor from December 2001.

1.3.4.5.1 Production Readiness Review - Event Builder \$0.00 \$0.00 \$0.00 0 0 0

Notes

WBS Description:

Production readiness review for the Event Builder. Successful outcome from the review means that we will proceed to the production phase of the project.

M&S BOE: N/A

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
"Production Readiness Review - Event Builder" continued							
<u>Notes</u>							
Schedule BOE: lag of 100 days due to anticipated funding for FY2004							
1.3.4.5.3	Production Readiness Review - Event Builder	\$0.00	\$0.00	\$0.00	0	0	2
<u>Notes</u>							
WBS Description:							
After the system has been proven to work as a prototype a readiness review formally approves the purchase of the full size system.							
1.3.4.5.4	purchase remaining hardware	\$310,500.00	\$310,500.00	\$0.00	0	0	0
<u>Notes</u>							
WBS Description:							
This summary task covers the purchase of the remaining hardware to construct the full size system. It includes the submission of the purchase order and implementation plan, purchase formality and ends with the arrival of the hardware.							
1.3.4.5.4.1	submit PO and implementation plan	\$0.00	\$0.00	\$0.00	0	0	3
<u>Notes</u>							
WBS Description:							
The submission of the purchase order and the implementation plan is a milestone.							
1.3.4.5.4.2	purchase formalities	\$310,500.00	\$310,500.00	\$0.00	0.3	0	0
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Work</i>	<i>Delay</i>	<i>Start</i>	<i>Finish</i>	
9	MANDS	310,500	310,500	0 days	Wed 11/3/04	Thu 2/3/05	
<i>ID</i>	<i>Resource Name</i>	<i>Units</i>	<i>Cost</i>	<i>Baseline Cost</i>	<i>Act. Cost</i>	<i>Rem. Cost</i>	
9	MANDS	310,500	\$310,500.00	\$0.00	\$0.00	\$310,500.00	
<u>Notes</u>							
WBS Description:							
Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.							
M/S BOE:							
Vendor quote December 2001							
Labor BOE: N/A							

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.4.5.4.4	arrival of the hardware	\$0.00	\$0.00	\$0.00	0	0	2

Notes
 WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the production system installation.

1.3.4.5.5	assemble new hardware in B0 third floor	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	16 hrs	0 days	Fri 2/4/05	Thu 2/17/05	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	80 hrs	0 days	Fri 2/4/05	Thu 2/17/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes
 WBS Description:

The assembly of the new hardware should go smoothly since the room is well prepared.

M/S BOE: N/A

Labor BOE:
 Based upon experience with the Run 2a system.

1.3.4.5.6	evaluate the new hardware and software	\$0.00	\$0.00	\$0.00	0	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	16 hrs	0 days	Fri 2/18/05	Thu 3/3/05	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	80 hrs	0 days	Fri 2/18/05	Thu 3/3/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes
 WBS Description:

The evaluation of the new hardware might reveal problems in some of the components and we leave some time in case hardware needs to be exchanged by the vendor. The new software is being tested as well.

M/S BOE: N/A

Labor BOE:
 Based upon experience with the Run 2a system.

1.3.4.5.7	MS: establish functionality of hardware	\$0.00	\$0.00	\$0.00	0	0	3
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Notes
 WBS Description:

Establishing the hardware functionality of the test system is a milestone and marks the point when the complete system should be purchased.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont	Level
1.3.4.5.8	EVB construct full size system schedule contingency	\$0.00	\$0.00	\$0.00	0	0	0
1.3.4.6	commissioning of hardware and software	\$0.00	\$0.00	\$0.00	0.3	0.5	0
	<u>Notes</u>						
	WBS Description:						
	Hardware and software commissioning involves data taking since only then the last problems can be found and corrected. Experience from Run IIa show that 2 month is a reasonable time to fix the most important problems.						
	M/S BOE: N/A						
	Labor BOE: Based upon experience with the Run 2a system.						
1.3.4.8	Finish Event-Builder Upgrade	\$0.00	\$0.00	\$0.00	0	0	2
	<u>Notes</u>						
	WBS Description:						
	This milestone marks the end of the Event-Builder upgrade. This means that the hardware is in place and has been proven to technically work, the software development has been finished and its functionality has been proven with real data.						
1.3.5	Computer for Level3 PC Farm / DAQ	\$382,500.00	\$382,500.00	\$0.00	0	0	0
	<u>Notes</u>						
	WBS Description:						
	This summary task covers the computer purchases for the general DAQ system and the Level-3 PC Farm. The purchases are staged since they are replacing PCs which become obsolete. Prices are based on a recent purchase of similar hardware.						
1.3.5.1	Start Computers for Level3 PC Farm/DAQ	\$0.00	\$0.00	\$0.00	0	0	3
	<u>Notes</u>						
	WBS Description:						
	This milestone marks the beginning of the DAQ and Level3 computer purchases.						
1.3.5.2	replace 10 DAQ PCs (2003)	\$15,000.00	\$15,000.00	\$0.00	0	0	0
	<u>Notes</u>						
	WBS Description:						
	Summary task describing the purchase of 10 DAQ computers in FY2003.						
1.3.5.2.1	submit PO and implementation plan	\$0.00	\$0.00	\$0.00	0	0	3
	<u>Notes</u>						
	WBS Description:						
	The submission of the purchase order and the implementation plan is a milestone.						

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.5.2.2	purchase formalities	\$15,000.00	\$15,000.00	\$0.00	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	15,000	15,000	0 days	Tue 6/3/03	Tue 8/26/03	\$15,000.00	\$0.00	\$0.00	\$15,000.00

Notes

WBS Description:

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.

M&S BOE:

PO from recent run 2a equipment purchase.

LABOR BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.5.2.3	install and test one prototype machine	\$0.00	\$0.00	\$0.00	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	16 hrs	0 days	Wed 8/27/03	Wed 9/10/03	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	80 hrs	0 days	Wed 8/27/03	Wed 9/10/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

To insure that the machines perform to the specifications and to download the appropriate software they are installed and tested at Fermilab. The prototype is sent back to the vendor for cloning.

M&S BOE: - N/A

Labor BOE:

Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.5.2.5	arrival of 0/10 PCs from the vendor	\$0.00	\$0.00	\$0.00	0	0	2

Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the test system installation.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.5.2.6	burn in phase	\$0.00	\$0.00	\$0.00	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	50%	40 hrs	0 days	Thu 9/18/03	Wed 10/1/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

In the burn in phase the PCs are running under load to find potential problems. The vendor is responsible to replace failing hardware in due time.

M&S BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"burn in phase" continued

Notes

Labor BOE:
Based upon experience with the Run 2a system.

1.3.5.2.7 installation into the DAQ system \$0.00 \$0.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	8 hrs	0 days	Thu 10/2/03	Wed 10/8/03	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	40 hrs	0 days	Thu 10/2/03	Wed 10/8/03	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

The installation of the nodes into their final location should be rather smooth since the environment will be well prepared.

M&S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

1.3.5.2.8 Replace 10 DAQ PCs schedule contingency \$0.00 \$0.00 \$0.00 0 0 0

1.3.5.3 replace 15 DAQ PCs (2004) \$22,500.00 \$22,500.00 \$0.00 0 0 0

Notes

WBS Description:

Summary task describing the purchase of 15 DAQ computers in FY004.

1.3.5.3.1 submit PO and implementation plan \$0.00 \$0.00 \$0.00 0 0 3

Notes

WBS Description:

The submission of the purchase order and the implementation plan is a milestone.

1.3.5.3.2 purchase formalities \$22,500.00 \$22,500.00 \$0.00 0.3 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	22,500	22,500	0 days	Tue 11/2/04	Wed 2/2/05	\$22,500.00	\$0.00	\$0.00	\$22,500.00

Notes

WBS Description:

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.

M&S BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"purchase formalities" continued

Notes

Recent PO for similar purchase in run 2a.

Labor BOE: N/A

Schedule BOE: lag of 230 days due to anticipated funding for FY2004

1.3.5.3.3 install and test one prototype machine \$0.00 \$0.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	16 hrs	0 days	Thu 2/3/05	Wed 2/16/05	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	80 hrs	0 days	Thu 2/3/05	Wed 2/16/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

To insure that the machines perform to the specifications and to download the appropriate software they are installed and tested at Fermilab. The prototype is sent back to the vendor for cloning.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.5.3.4 arrival of 15 DAQ PCs from the vendor \$0.00 \$0.00 \$0.00 0 0 3

Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the test system installation.

1.3.5.3.5 burn in phase \$0.00 \$0.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	50%	40 hrs	0 days	Thu 2/24/05	Wed 3/9/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

In the burn in phase the PCs are running under load to find potential problems. The vendor is responsible to replace failing hardware in due time.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"burn in phase" continued

Notes

1.3.5.3.6 installation into the DAQ system \$0.00 \$0.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	8 hrs	0 days	Thu 3/10/05	Wed 3/16/05	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	40 hrs	0 days	Thu 3/10/05	Wed 3/16/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

The installation of the nodes into their final location should be rather smooth since the environment will be well prepared.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.5.3.8 Replace 15 DAQ PCs schedule contingency \$0.00 \$0.00 \$0.00 0 0 0

1.3.5.4 replace 20 DAQ PCs (2005) \$30,000.00 \$30,000.00 \$0.00 0 0 0

Notes

WBS Description:

Summary task describing the purchase of 20 DAQ computers in FY2005.

1.3.5.4.1 submit PO and implementation plan \$0.00 \$0.00 \$0.00 0 0 3

Notes

WBS Description:

The submission of the purchase order and the implementation plan is a milestone.

1.3.5.4.2 purchase formalities \$30,000.00 \$30,000.00 \$0.00 0.3 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	30,000	30,000	0 days	Fri 12/10/04	Thu 3/10/05	\$30,000.00	\$0.00	\$0.00	\$30,000.00

Notes

WBS Description:

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.

M&S BOE:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"purchase formalities" continued

Notes

Based on recent PO from similar run 2a purchase

Labor BOE: N/A

1.3.5.4.3 install and test one prototype machine \$0.00 \$0.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	16 hrs	0 days	Fri 3/11/05	Thu 3/24/05	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	80 hrs	0 days	Fri 3/11/05	Thu 3/24/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

To insure that the machines perform to the specifications and to download the appropriate software they are installed and tested at Fermilab. The prototype is sent back to the vendor for cloning.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.5.4.4 arrival of 20 DAQ PCs from the vendor \$0.00 \$0.00 \$0.00 0 0 3

Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the test system installation.

1.3.5.4.5 burn in phase \$0.00 \$0.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	50%	40 hrs	0 days	Fri 3/25/05	Thu 4/7/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

In the burn in phase the PCs are running under load to find potential problems. The vendor is responsible to replace failing hardware in due time.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.5.4.6	installation into the DAQ system	\$0.00	\$0.00	\$0.00	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	8 hrs	0 days	Fri 4/8/05	Thu 4/14/05	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	40 hrs	0 days	Fri 4/8/05	Thu 4/14/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

The installation of the nodes into their final location should be rather smooth since the environment will be well prepared.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.5.4.8	Replace 20 DAQ PCs schedule contingency	\$0.00	\$0.00	\$0.00	0	0	0
1.3.5.5	replace 70 Level 3 PCs (2004)	\$105,000.00	\$105,000.00	\$0.00	0	0	0

Notes

WBS Description:

Summary task describing the purchase of 70 level 3 computers in FY2004.

1.3.5.5.1	submit PO and implementation plan	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

The submission of the purchase order and the implementation plan is a milestone.

1.3.5.5.2	purchase formalities	\$105,000.00	\$105,000.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish
9	MANDS	105,000	105,000	0 days	Tue 11/2/04	Wed 2/2/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	105,000	\$105,000.00	\$0.00	\$0.00	\$105,000.00

Notes

WBS Description:

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.

M&S BOE:

Recent PO for similar purchase in run 2a.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"purchase formalities" continued

Notes

Labor BOE: N/A

Schedule BOE: lag of 230 days due to anticipated funding for FY2004

1.3.5.5.3 install and test one prototype machine \$0.00 \$0.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	16 hrs	0 days	Thu 2/3/05	Wed 2/16/05	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	80 hrs	0 days	Thu 2/3/05	Wed 2/16/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

To insure that the machines perform to the specifications and to download the appropriate software they are installed and tested at Fermilab. The prototype is sent back to the vendor for cloning.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.5.5.5 arrival of 70 Level3 and 15 DAQ PCs from the vendor \$0.00 \$0.00 \$0.00 0 0 2

Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the installation of 70 Level 3 worker node PC's and 15 DAQ PC's.

1.3.5.5.6 burn in phase \$0.00 \$0.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	50%	40 hrs	0 days	Thu 2/24/05	Wed 3/9/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

In the burn in phase the PCs are running under load to find potential problems. The vendor is responsible to replace failing hardware in due time.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.5.5.7	installation into the DAQ system	\$0.00	\$0.00	\$0.00	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	8 hrs	0 days	Thu 3/10/05	Wed 3/16/05	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	40 hrs	0 days	Thu 3/10/05	Wed 3/16/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes
 WBS Description:

The installation of the nodes into their final location should be rather smooth since the environment will be well prepared.

M&S BOE: N/A

Labor BOE:
 Based upon experience with the Run 2a system.

1.3.5.6	replace 140 Level 3 PCs (2005)	\$210,000.00	\$210,000.00	\$0.00	0	0	0
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Notes
 WBS Description:

Summary task describing the purchase of 140 level 3 computers in FY2005.

1.3.5.6.1	submit PO and implementation plan	\$0.00	\$0.00	\$0.00	0	0	3
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Notes
 WBS Description:

The submission of the purchase order and the implementation plan is a milestone.

1.3.5.6.2	purchase formalities	\$210,000.00	\$210,000.00	\$0.00	0.3	0	0
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ID	Resource Name	Units	Work	Delay	Start	Finish
9	MANDS	210,000	210,000	0 days	Fri 12/10/04	Thu 3/10/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	210,000	\$210,000.00	\$0.00	\$0.00	\$210,000.00

Notes
 WBS Description:

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.

M&S BOE:

Based on recent PO from similar run 2a purchase

Labor BOE: N/A

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"purchase formalities" continued

Notes

1.3.5.6.3 install and test one prototype machine \$0.00 \$0.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	16 hrs	0 days	Fri 3/11/05	Thu 3/24/05	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	80 hrs	0 days	Fri 3/11/05	Thu 3/24/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

To insure that the machines perform to the specifications and to download the appropriate software they are installed and tested at Fermilab. The prototype is sent back to the vendor for cloning.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.5.6.5 arrival of 140/20 PCs from the vendor \$0.00 \$0.00 \$0.00 0 0 2

Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the installation of 140 Level 3 PCs and 20 DAQ PC's.

1.3.5.6.6 burn in phase \$0.00 \$0.00 \$0.00 0 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	50%	40 hrs	0 days	Fri 3/25/05	Thu 4/7/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

In the burn in phase the PCs are running under load to find potential problems. The vendor is responsible to replace failing hardware in due time.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
1.3.5.6.7	installation into the DAQ system	\$0.00	\$0.00	\$0.00	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	8 hrs	0 days	Fri 4/8/05	Thu 4/14/05	\$0.00	\$0.00	\$0.00	\$0.00
8	StudentU	100%	40 hrs	0 days	Fri 4/8/05	Thu 4/14/05	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

The installation of the nodes into their final location should be rather smooth since the environment will be well prepared.

M&S BOE: N/A

Labor BOE:

Based upon experience with the Run 2a system.

1.3.5.8	Finish Purchase of Computers for Level3/DAQ system	\$0.00	\$0.00	\$0.00	0	0	2
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Notes

WBS Description:

This milestone marks the end of the PC purchases for the DAQ and the Level3 PC Farm.

1.3.6	SVT upgrade	\$231,600.00	\$231,600.00	\$0.00	0	0	0
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Notes

WBS Description:

CDF Silicon Vertex Tracker Run 2b upgrade. Upgrade necessary due to differences between SVX IIa and SVX IIb detector geometry. System operation identical to the Run 2a SVT.

1.3.6.1	Start of SVT upgrade	\$0.00	\$0.00	\$0.00	0	0	3
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Notes

WBS Description:

Milestone to begin SVT upgrade.

1.3.6.2	trackfitter boards	\$161,600.00	\$161,600.00	\$0.00	0	0	0
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Notes

WBS Description:

Summary task to produce new Track Fitter boards. New boards necessary to handle SVX IIb geometry.

1.3.6.2.1	Upgrade SVT trackfitters (FNAL)	\$161,600.00	\$161,600.00	\$0.00	0.3	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish
10	MANDSPASS	128,000	128,000	0 days	Wed 6/23/04	Mon 12/13/04
12	MANDSPASSL	33,600	33,600	0 days	Wed 6/23/04	Mon 12/13/04

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
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"Upgrade SVT trackfitters (FNAL)" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	128,000	\$128,000.00	\$0.00	\$0.00	\$128,000.00
12	MANDSPASSL	33,600	\$33,600.00	\$0.00	\$0.00	\$33,600.00

Notes

WBS Description:

This task includes

The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE:

Labor BOE:

50% of 1 Electrical Engineering from U of Chicago - 6 mons (480 hrs) @ \$70/hr = \$33600

Subject: Re: Run 2b SVT

Date: Tue, 27 Aug 2002 17:11:05 -0500 (CDT)

From: Mel Shochet <shochet@hep.uchicago.edu>

To: Kevin Pitts <kpitts@uiuc.edu>

CC: Luciano Ristori <luciano@fnal.gov>,

Bill Ashmanskas <ashmansk@hep.uchicago.edu>

Hi Kevin,

Based on discussions with Bill and Mircea (our engineer), it seems likely that the cost of parts, PC boards, and stuffing the new track fitters will be close to that for the original track fitters. However the new chips that will be used require a new PCB design and thus engineering time. The latter is estimated to be \$68K (6 months of an engineer). The cost of the original track fitters were:

PCBs	\$10K
assembly	\$11K
parts (with spares)	\$73K
TOTAL	\$94K

This makes the grand total \$162K.

Mel

1.3.6.2.2	Upgrade SVT trackfitters (Chicago)	\$0.00	\$0.00	\$0.00	0.5	0.5	0
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ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	Wed 6/23/04	Mon 12/13/04	\$0.00	\$0.00	\$0.00	\$0.00

Notes

WBS Description:

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level
"Upgrade SVT trackfitters (Chicago)" continued							
	<u>Notes</u>						
	This task includes The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.						
	M&S BOE:						
	Labor BOE:						
	50% of 1 Electrical Engineering from U of Chicago - 6 mons (480 hrs) @ \$70/hr						
	Subject: Re: Run 2b SVT Date: Tue, 27 Aug 2002 17:11:05 -0500 (CDT) From: Mel Shochet <shochet@hep.uchicago.edu> To: Kevin Pitts <kpitts@uiuc.edu> CC: Luciano Ristori <luciano@fnal.gov>, Bill Ashmanskas <ashmansk@hep.uchicago.edu>						
	Hi Kevin, Based on discussions with Bill and Mircea (our engineer), it seems likely that the cost of parts, PC boards, and stuffing the new track fitters will be close to that for the original track fitters. However the new chips that will be used require a new PCB design and thus engineering time. The latter is estimated to be \$68K (6 months of an engineer). The cost of the original track fitters were:						
	PCBs \$10K assembly \$11K parts (with spares) \$73K TOTAL \$94K						
	This makes the grand total \$162K.						
	Mel						
1.3.6.2.3	SVT Trackfitter boards schedule contingency	\$0.00	\$0.00	\$0.00	0	0	0
1.3.6.3	Merger boards	\$70,000.00	\$70,000.00	\$0.00	0	0	0

Notes

WBS Description:

Summary task for the production of new SVT Merger boards. These boards are identical to the Run 2a Merger boards.

WBS Dictionary as of Mon 10/21/02
CDF Run 2B Data Acquisition and Trigger Upgrade

WBS	Name	Cost	M&S	Labor	M&S Cont.	Labor Cont.	Level																						
1.3.6.3.1	Upgrade SVT merger boards	\$70,000.00	\$70,000.00	\$0.00	0.3	0.3	0																						
	<table border="1"> <thead> <tr> <th>ID</th> <th>Resource Name</th> <th>Units</th> <th>Work</th> <th>Delay</th> <th>Start</th> <th>Finish</th> <th>Cost</th> <th>Baseline Cost</th> <th>Act. Cost</th> <th>Rem. Cost</th> </tr> </thead> <tbody> <tr> <td>11</td> <td>INKIND</td> <td>70,000</td> <td>70,000</td> <td>0 days</td> <td>Tue 2/3/04</td> <td>Tue 6/22/04</td> <td>\$70,000.00</td> <td>\$0.00</td> <td>\$0.00</td> <td>\$70,000.00</td> </tr> </tbody> </table>	ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost	11	INKIND	70,000	70,000	0 days	Tue 2/3/04	Tue 6/22/04	\$70,000.00	\$0.00	\$0.00	\$70,000.00						
ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost																			
11	INKIND	70,000	70,000	0 days	Tue 2/3/04	Tue 6/22/04	\$70,000.00	\$0.00	\$0.00	\$70,000.00																			
	<u>Notes</u>																												
	WBS Description:																												
	Run 2b SVT Merger boards identical to Run 2a Merger boards. Additional boards required for Run 2b system.																												
	M&S BOE:																												
	Estimate from Run 2a Merger board production.																												
	Uncertainty based upon the need for some possible rework due obsolete components.																												
	Labor BOE: N/A																												
1.3.6.5	SVT ready for installation	\$0.00	\$0.00	\$0.00	0	0	2																						
	<u>Notes</u>																												
	WBS Description:																												
	Milestone denoting the completion of the SVT.																												
1.3.8	Finish Run 2b Trigger DAQ project	\$0.00	\$0.00	\$0.00	0	0	2																						
	<u>Notes</u>																												
	WBS Description:																												
	Milestone marking the end of the CDF Run 2b Trigger/DAQ upgrade subproject.																												
1.3.9	Data Acquisition and Trigger Upgrades Ready for Installation	\$0.00	\$0.00	\$0.00	0	0	1																						
	<u>Notes</u>																												
	WBS Description:																												
	Milestone marking the end of the CDF Run 2b Trigger/DAQ upgrade subproject. This milestone is coupled to the corresponding level 2 milestone with added schedule contingency.																												
1.31	Start of Run 2b DAQ and Trigger Project	\$0.00	\$0.00	\$0.00	0	0	3																						
	<u>Notes</u>																												
	WBS Description:																												
	Milestone - marking the beginning of the Run 2b DAQ and Trigger upgrade project																												