Date: August 23, 2002

To: ISRP

From: Sandra Downing, NOAA Fisheries (NMFS)

RE: Project 198331900. New Marking and Monitoring Techniques for Fish

The ISRP review asked us to provide prioritization, budget details, and a plan for monitoring and evaluating each of the subprojects. The proposal includes five research objectives that could be designated subprojects. They are:

1. to upgrade the FS1001A transceiver that was developed to interrogate adult salmonids in fish ladders
2. to develop and evaluate a high-flow interrogation system for the corner collector at Bonneville Dam
3. to continue the development of in-stream interrogation systems
4. to help convert the flat-plate system for juvenile salmonids at Bonneville Dam to work with FS1001A transceivers
5. to adapt state-of-the-art technology to expand the capabilities of PIT-tag technology and thereby improve collection of information for the fish managers

Prioritization

The investigators would prioritize the objectives in the same order as they are listed above. We believe that completing Objectives 1-4 is critical for providing the infrastructure support that the fisheries community needs to satisfy RPA Actions 50, 87, and 192. We appreciate having the authors of the 2000 BIOP clarify that Objective 5 does not appear to address RPA Action 193 as it was intended by them. Therefore, if CBFWA wishes we will withdraw this subproject; however, we do believe it is important for the fisheries community to invest in the development of future RME tools that may yield better estimates of survival. For example, developing an effective automated fish identification and enumeration system could significantly improve the return estimates that the fish managers use in their efforts to restore threatened and endangered stocks. In addition, the development of a semi-active radio-PIT tag might in the future enable the fisheries community to interrogate fish in spillways.

The RME Hydro Subgroup concurred that Objectives 1, 2, and 4 are critical to addressing Actions 50, 87, and 192. Unfortunately, the RME Status-Monitoring Subgroup did not evaluate Objective 3 as recommended by the Hydro Subgroup. However, the need for installation of in-stream detection systems is specifically listed in #3 in the future needs section of the mainstem/systemwide juvenile and adult passage program summary where BPA lists eight items that it needs to fund to help satisfy the NMFS BIOP Performance Objectives.

Budget

Objectives 1 and 2 are complex, highly technical development subprojects, as reflected in the budget portion of the proposal:

Objective	Description	FY03
1	upgraded transceiver	468,100
2	development and evaluation of high-flow system	181,100
3	in-stream interrogation system	74,700
4	conversion of the flat-plate system	41,900
5	adaptation of the state-of-the-art technology	61,500

Total = 827.3K + administration costs

ISRP requested that the future objectives be identified with their main objectives or subprojects and that a budget summary be presented to demonstrate the future breakdown.

Main objective	List of future objectives/tasks	FY04-05
1	future objectives 1-5	503,300
2	future objectives 7-13	724,000
3	future objective 6	268,000
4	NA	
5	future objective 14	468,500

Total = 1963.8K + administration costs

It is important to remember that for Objective 1 (upgraded transceiver) the private company, Digital Angel, is matching this with in-kind support equal to $468,000 over the 3-year period.

The U.S. Army Corps of Engineers (Corps) is also supporting the development of the high-flow system. They are funding the work performed by Pacific Northwest National Laboratory (PNNL).

Monitoring and Evaluation Plans

Upgraded transceiver and high-flow subprojects -- For both the upgraded transceiver and high-flow subprojects, the plan is to have multi-agency technical groups that will closely monitor the progress of the developments. This approach worked well with both the development of the original 134.2-kHz transceiver to replace the 400-kHz equipment at the juvenile fish facilities and the 134.2-kHz transceiver developed to interrogate adult salmonids returning in fish ladders. This approach was outlined in the detailed project plan for upgrading the FS1001A transceivers that was attached with the original proposal (both project plans are attached to this document). Generally in this approach, a requirements document is written that would then be distributed throughout the fisheries community for review. Then during the development of each major component, there is a design review by the technical group and then a prototype is fabricated that is then tested thoroughly in-house with the results reviewed by the technical group. Finally, there will be several complete prototypes fabricated that will undergo independent laboratory and field testing by the technical group to ensure that the system satisfies the requirements document. During the whole process, the schedule calls for periodic status conference calls; however, in the past, conference calls were also held immediately when problems arose to ensure that the pros and cons of different solutions were fully discussed.

In the high-flow subproject, there are a number of parties involved so that coordination will be critical if it is to succeed; especially, as both BPA and the Corps are funding parts of the project. In this subproject, PNNL will manage the project, NMFS will head up the biological evaluation, Digital Angel will head up the transceiver development and the antenna development, Digital Angel will also manufacture the transceivers and antennas, PSMFC will head up the installation of the electronic components while the Corps and its contractors will be in charge of the installation drawings and the antenna and infrastructure installation. All of these parties will need to collaborate to try to meet the installation schedule. PNNL will also need to do a good job of recording events so that the technical group can do its monitoring task. Until a prototype design is completed, it is not possible for NMFS to prepare a test plan for the biological evaluation. We will certainly tag sufficient numbers of juvenile fish from different species in order to get solid estimates of the reading efficiency of the system as well as the impact of debris on fish condition. As indicated in the proposal, the plan will be widely distributed for review.

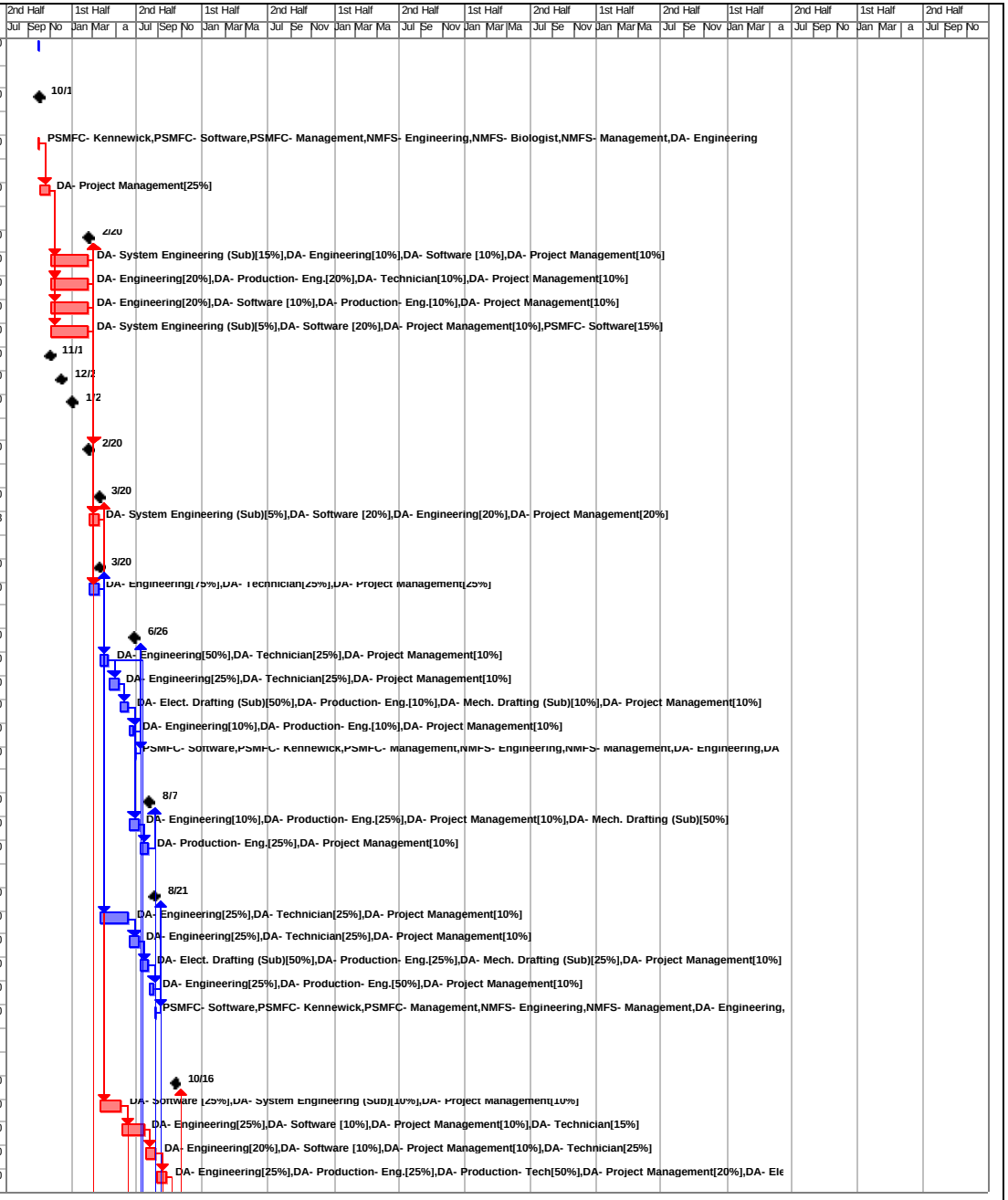
In-stream interrogation system -- For the in-stream interrogation system, the prototype components for auto-tuning and antenna switching (multiplexing) will be tested at the NMFS Pasco Research Station in October 2002. At this site, there is a stream with a water level that can be adjusted to mimic stream conditions when the auto-tuning feature would be needed. The stream can also handle multiple antennas, so that both the multiplexing feature and the ability to turn off an antenna automatically when it is no longer under water can be tested. We will use read range as one measure of how well the system auto-tunes itself – i.e., over what amount of water level change, does the system maintain a read range of X cm. Then in the multiplexing tests, one test will determine how quickly an antenna switches between active and inactive states. In another test, we will confirm that if a fish is swimming over one antenna, the system will not switch to the next antenna before the tag code is transmitted. We have a list of real-life conditions that we will use to determine how the prototypes respond and what their limitations are. If the prototypes are too limited, NMFS will need to evaluate whether it is worth the cost of further development or to wait for the upgraded transceiver. Similar tests will also be conducted with the upgraded transceiver when it is available. The development of the backpack-sized portable transceiver would use the approach outlined above for the upgraded transceiver and corner-collector system.

Flat-plate conversion -- Over the years, NMFS has recorded the read range and field size for the ISO-based flat-plate system using the Patten-Engineering transceiver. These same measurements will be taken on the converted system to ensure that the fisheries community can have confidence in the data that are collected by the converted system. In addition, NMFS will conduct a biological evaluation using the

same procedure it has used with the 400-kHz and then with the original ISO-based system. Thus, there will be a direct comparison of the performance of the converted system and its predecessors using PIT-tagged fish.

State-of-the-art technology -- If the fisheries community decides to move forward with supporting the R&D work to adapt state-of-the-art technologies to fisheries applications, then in each case, the R&D work would be conducted in a step-by-step process so that if a tool fails to satisfy a critical test, then work would stop on that project. Otherwise, this subproject involves interfacing with tag manufacturers to encourage them in their efforts to adapt their technologies to fisheries applications. NMFS would help evaluate these products to determine how well they can be adapted to fisheries applications.

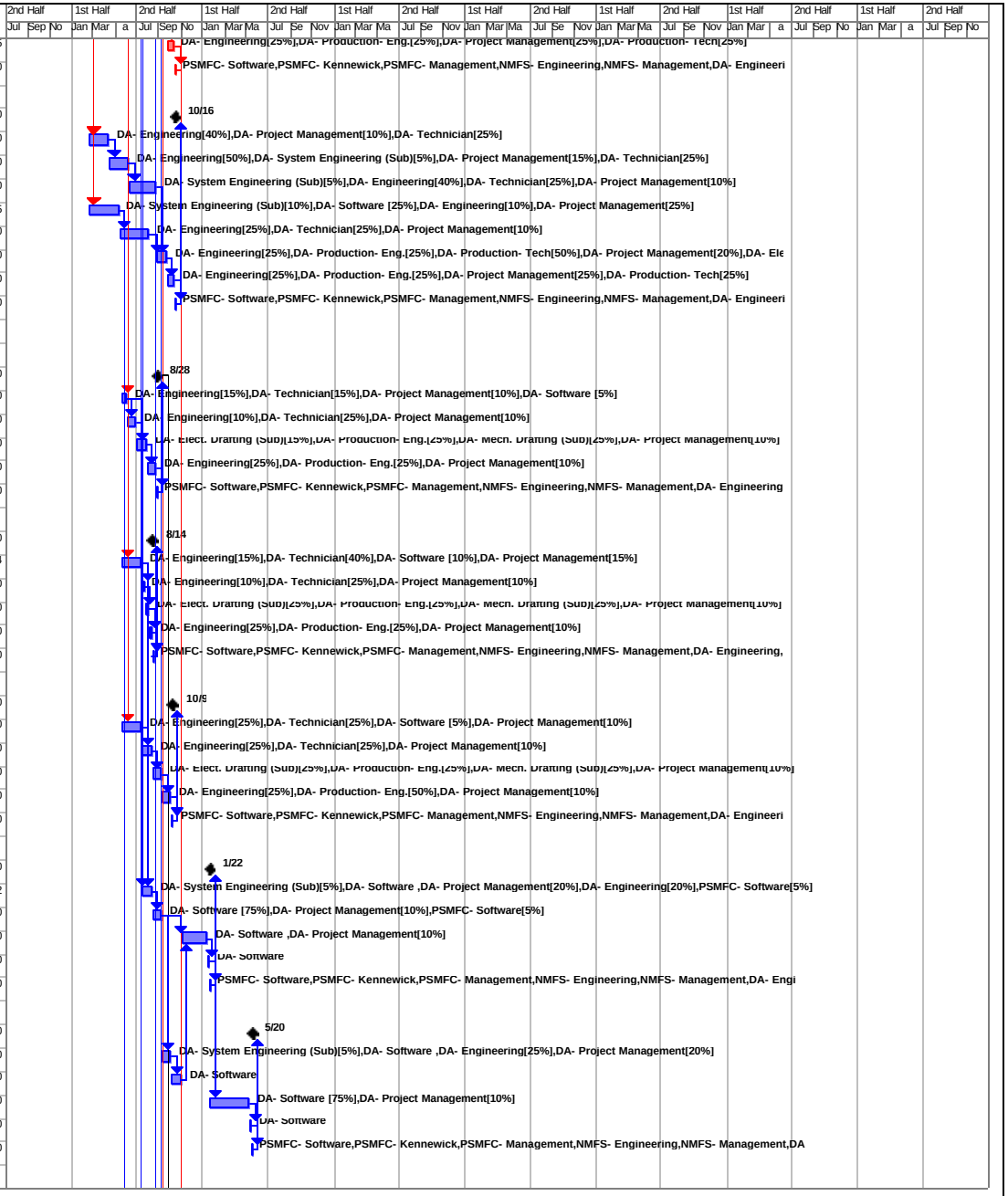
ID	Task Name	Duration	Start	Finish	Cost
1	**Project Plan to upgrade the FS1001A**	1 day?	Tue 10/1/02	Tue 10/1/02	$0.00
2					
3	**FS1001A + New Requirements**	1 day?	Tue 10/1/02	Tue 10/1/02	$0.00
4					
5	**Technical Summit Meeting @ DA**	2 days	Tue 10/1/02	Wed 10/2/02	$8,800.00
6					
7	Final Spec. and Requirements	1 mon	Thu 10/3/02	Wed 10/30/02	$3,000.00
8					
9	**System Packaging/Hardware/Software Definition**	1 day?	Thu 2/20/03	Thu 2/20/03	$0.00
10	DSP System Arcitecture Design	4 mons	Thu 10/31/02	Wed 2/19/03	$28,000.00
11	Packaging Requirements Generation	4 mons	Thu 10/31/02	Wed 2/19/03	$21,200.00
12	Hardware/ Partitioning Requirements	4 mons	Thu 10/31/02	Wed 2/19/03	$25,600.00
13	Software Requirements/ Proc. Selection	4 mons	Thu 10/31/02	Wed 2/19/03	$21,600.00
14	Status conference call	0.25 days	Fri 11/1/02	Fri 11/1/02	$1,100.00
15	Status conference call	0.25 days	Mon 12/2/02	Mon 12/2/02	$1,100.00
16	Status conference call	0.25 days	Thu 1/2/03	Thu 1/2/03	$1,100.00
17					
18	**Hardware/ Software Design**	1 day?	Thu 2/20/03	Thu 2/20/03	$0.00
19					
20	Hardware/ Software Timing Diagram	1 day?	Thu 3/20/03	Thu 3/20/03	$0.00
21	Hardware/ Software System Task Timing Diagram	1 mon	Thu 2/20/03	Wed 3/19/03	$8,015.38
22					
23	System Power and Grounding Design	1 day?	Thu 3/20/03	Thu 3/20/03	$0.00
24	Power and Grounding Design/ Drawing	1 mon	Thu 2/20/03	Wed 3/19/03	$10,400.00
25					
26	Interconnect Design/ Selection	1 day?	Thu 6/26/03	Fri 6/27/03	$0.00
27	Select OTS/ Interconnect Design	1 mon	Thu 3/20/03	Wed 4/16/03	$9,200.00
28	Diagnostic Test and Hardware Design	1 mon	Thu 4/17/03	Wed 5/14/03	$6,200.00
29	Schematic Capture, BOM, Mech. Drawing	1 mon	Thu 5/15/03	Wed 6/11/03	$9,600.00
30	Producibility Review of Components	2 wks	Thu 6/12/03	Wed 6/25/03	$1,800.00
31	Design Review	0.25 days	Thu 6/26/03	Thu 6/26/03	$1,100.00
32					
33	System Enclosure	1 day?	Thu 8/7/03	Thu 8/7/03	$0.00
34	Drawing for System Enclosure (options)	1 mon	Thu 6/12/03	Wed 7/9/03	$10,542.50
35	BOM for Enclosure	1 mon	Thu 7/10/03	Wed 8/6/03	$4,200.00
36					
37	Power Supply Hardware	1 day?	Thu 8/21/03	Fri 8/22/03	$0.00
38	Selection/ Power Supply Design	3 mons	Thu 3/20/03	Wed 6/11/03	$18,600.00
39	Diagnostic Test and Hardware Design	1 mon	Thu 6/12/03	Wed 7/9/03	$6,200.00
40	Schematic Capture, BOM, Mech. Drawing	1 mon	Thu 7/10/03	Wed 8/6/03	$13,200.00
41	Producibility Review of Components	2 wks	Thu 8/7/03	Wed 8/20/03	$5,100.00
42	Design Review	0.25 days	Thu 8/21/03	Thu 8/21/03	$1,100.00
43					
44					
45	CPU Hardware	1 day?	Thu 10/16/03	Fri 10/17/03	$0.00
46	Selection/ CPU Design	9 wks	Thu 3/20/03	Wed 5/21/03	$16,200.00
47	Peripherial Hardware Design	9 wks	Thu 5/22/03	Wed 7/23/03	$15,750.00
48	Diagnostic Test and Hardware Design	5 wks	Thu 7/24/03	Wed 8/27/03	$9,000.00
49	Schematic Capture, BOM, Mech. Drawing	1 mon	Thu 8/28/03	Wed 9/24/03	$21,400.00



Project: Generation 2 Reader
Date: Mon 6/3/02

Task | Milestone | Rolled Up Critical Task | Split | Group By Summary
Critical Task | Summary | Rolled Up Milestone | External Tasks
Progress | Rolled Up Task | Rolled Up Progress | Project Summary

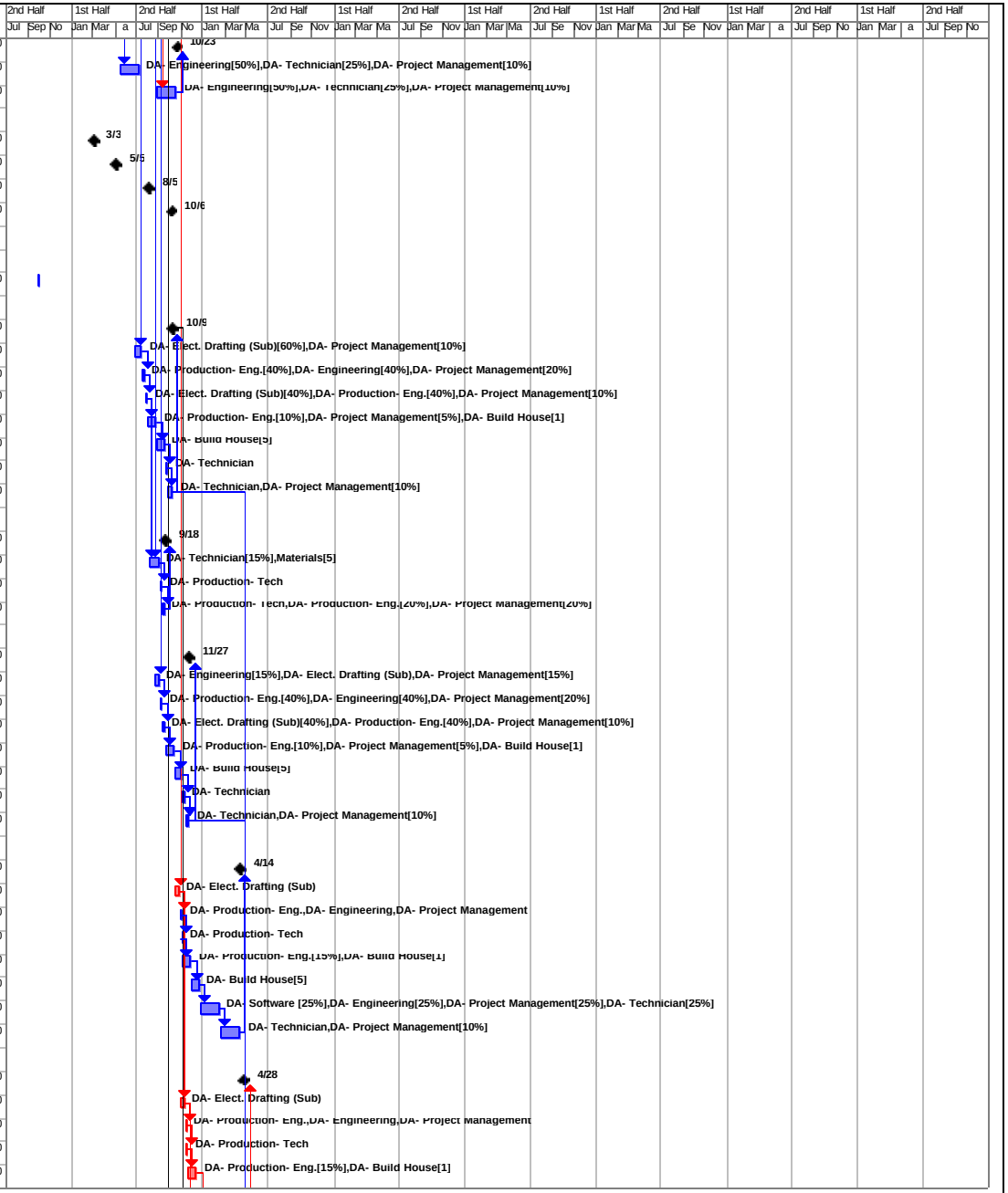
ID	Task Name	Duration	Start	Finish	Cost
50	Producibility Review of Components	3 wks	Thu 9/25/03	Wed 10/15/03	$4,645.45
51	Design Review	0.25 days	Thu 10/16/03	Thu 10/16/03	$1,100.00
52					
53	Analog Board	1 day?	Thu 10/16/03	Fri 10/17/03	$0.00
54	Driver Design Design Review and Design Checkout	2 mons	Thu 2/20/03	Wed 4/16/03	$16,000.00
55	Detector Design Review and Design Checkout	2 mons	Thu 4/17/03	Wed 6/11/03	$20,400.00
56	Filter/ Anti-alias Filter Design	11 wks	Thu 6/12/03	Wed 8/27/03	$24,750.00
57	Processor Selection and Supporting Hardware Design	3 mons	Thu 2/20/03	Wed 5/14/03	$25,854.55
58	Diagnostic Test and Hardware Design	3 mons	Thu 5/15/03	Wed 8/6/03	$18,600.00
59	Schematic Capture, BOM, Mech. Drawing	1 mon	Thu 8/28/03	Wed 9/24/03	$21,400.00
60	Producibility Review of Components	3 wks	Thu 9/25/03	Wed 10/15/03	$4,645.00
61	Design Review	0.25 days	Thu 10/16/03	Thu 10/16/03	$1,100.00
62					
63					
64	Communication Interface Hardware (Fiber Optic)	1 day?	Thu 8/28/03	Fri 8/29/03	$0.00
65	Selection/ Primary Communication Hardware	2 wks	Thu 5/22/03	Wed 6/4/03	$2,500.00
66	Form Factor Adaption Design	1 mon	Thu 6/5/03	Wed 7/2/03	$4,400.00
67	Schematic Capture, BOM, Mech. Drawing	1 mon	Thu 7/3/03	Wed 7/30/03	$9,000.00
68	Producibility Review of Components	1 mon	Thu 7/31/03	Wed 8/27/03	$7,200.00
69	Design Review	0.25 days	Thu 8/28/03	Thu 8/28/03	$1,100.00
70					
71	Display/ Keypad/Keyboard Interface	1 day?	Thu 8/14/03	Fri 8/15/03	$0.00
72	Hardware Design/ Selection	2 mons	Thu 5/22/03	Wed 7/16/03	$13,657.14
73	Diagnostic Test and Hardware Design	1 wk	Thu 7/17/03	Wed 7/23/03	$1,100.00
74	Schematic Capture, BOM, Mech. Drawing	2 wks	Thu 7/24/03	Wed 8/6/03	$5,100.00
75	Producibility Review of Components	1 wk	Thu 8/7/03	Wed 8/13/03	$1,800.00
76	Design Review	0.25 days	Thu 8/14/03	Thu 8/14/03	$1,100.00
77					
78	Sensor Card Selection/ Design	1 day?	Thu 10/9/03	Fri 10/10/03	$0.00
79	Hardware Design/ Selection	2 mons	Thu 5/22/03	Wed 7/16/03	$14,000.00
80	Diagnostic Test and Hardware Design	1 mon	Thu 7/17/03	Wed 8/13/03	$6,200.00
81	Schematic Capture, BOM, Mech. Drawing	1 mon	Thu 8/14/03	Wed 9/10/03	$10,200.00
82	Producibility Review of Components	1 mon	Thu 9/11/03	Wed 10/8/03	$10,200.00
83	Design Review	0.25 days	Thu 10/9/03	Thu 10/9/03	$1,100.00
84					
85	CPU Software Design	1 day?	Thu 1/22/04	Fri 1/23/04	$0.00
86	Timing Diagram	1 mon	Thu 7/17/03	Wed 8/13/03	$20,385.32
87	Implementation Flow Chart	1 mon	Thu 8/14/03	Wed 9/10/03	$13,200.00
88	Initial Software Code Design	2.5 mons	Thu 11/6/03	Wed 1/14/04	$27,000.00
89	Performance/ Status Report	1 wk	Thu 1/15/04	Wed 1/21/04	$4,000.00
90	Design Review	0.25 days	Thu 1/22/04	Thu 1/22/04	$1,100.00
91					
92	Analog Processor Software Design	1 day?	Thu 5/20/04	Fri 5/21/04	$0.00
93	Timing Diagram	1 mon	Thu 9/11/03	Wed 10/8/03	$21,200.00
94	Implementation Flow Chart	1 mon	Thu 10/9/03	Wed 11/5/03	$16,000.00
95	Initial Software Code Design	4 mons	Thu 1/22/04	Wed 5/12/04	$36,800.00
96	Performance/ Status Report	1 wk	Thu 5/13/04	Wed 5/19/04	$4,000.00
97	Design Review	0.25 days	Thu 5/20/04	Thu 5/20/04	$1,100.00
98					



Project: Generation 2 Reader
Date: Mon 6/3/02

Task | Milestone | Rolled Up Critical Task | Split | Group By Summary
Critical Task | Summary | Rolled Up Milestone | External Tasks
Progress | Rolled Up Task | Rolled Up Progress | Project Summary

ID	Task Name	Duration	Start	Finish	Cost
99	FPGA Program (Glue Logic if Necessary)	1 day?	Thu 10/23/03	Thu 10/23/03	$0.00
100	Analog	2 mons	Thu 5/15/03	Wed 7/9/03	$18,400.00
101	CPU	2 mons	Thu 8/28/03	Wed 10/22/03	$18,400.00
102					
103	Status conference call	0.25 days	Mon 3/3/03	Mon 3/3/03	$1,100.00
104	Status conference call	0.25 days	Mon 5/5/03	Mon 5/5/03	$1,100.00
105	Status conference call	0.25 days	Tue 8/5/03	Tue 8/5/03	$1,100.00
106	Status conference call	0.25 days	Mon 10/6/03	Mon 10/6/03	$1,100.00
107					
108					
109	**Prototyping and System Integration**	1 day?	Tue 10/1/02	Tue 10/1/02	$0.00
110					
111	Interconnect Design/ Selection	1 day?	Thu 10/9/03	Fri 10/10/03	$0.00
112	PCB Layout (if necessary)	3 wks	Thu 6/26/03	Thu 7/17/03	$6,300.00
113	Electrical and Producibility Review of Layout	1 wk	Thu 7/17/03	Thu 7/24/03	$3,000.00
114	Modify BOM/ Layout per Review	1 wk	Thu 7/24/03	Thu 7/31/03	$2,700.00
115	Order Parts/ PCB (5 prototypes)	4 wks	Thu 7/31/03	Thu 8/28/03	$3,300.00
116	Fabricate 5 Prototypes	3 wks	Thu 8/28/03	Thu 9/18/03	$5,500.00
117	Board Level Hardware Integration	1 wk	Thu 9/18/03	Thu 9/25/03	$2,000.00
118	DVT Testing at Board Level	2 wks	Thu 9/25/03	Thu 10/9/03	$4,600.00
119					
120	System Enclosure	1 day?	Thu 9/18/03	Thu 9/18/03	$0.00
121	Order Parts/ Fabricate 5 units	4 wks	Thu 8/7/03	Wed 9/3/03	$3,700.00
122	Assemble 5 Units	1 wk	Thu 9/4/03	Wed 9/10/03	$2,000.00
123	Verify Mech. Drawing and BOM	1 wk	Thu 9/11/03	Wed 9/17/03	$3,200.00
124					
125	Power Supply	1 day?	Thu 11/27/03	Fri 11/28/03	$0.00
126	PCB Layout (if necessary)	2 wks	Thu 8/21/03	Thu 9/4/03	$7,800.00
127	Electrical and Producibility Review of Layout	1 wk	Thu 9/4/03	Thu 9/11/03	$3,000.00
128	Modify BOM/ Layout per Review	1 wk	Thu 9/11/03	Thu 9/18/03	$2,700.00
129	Order Parts/ PCB (5 prototypes)	4 wks	Thu 9/18/03	Thu 10/16/03	$3,300.00
130	Fabricate 5 Prototypes	3 wks	Thu 10/16/03	Thu 11/6/03	$5,500.00
131	Board Level Hardware Integration	1 wk	Thu 11/6/03	Thu 11/13/03	$2,000.00
132	DVT Testing at Board Level	2 wks	Thu 11/13/03	Thu 11/27/03	$4,600.00
133					
134	CPU	1 day?	Wed 4/14/04	Thu 4/15/04	$0.00
135	PCB Layout	2 wks	Thu 10/16/03	Thu 10/30/03	$6,000.00
136	Electrical and Producibility Review of Layout	2 days	Thu 10/30/03	Mon 11/3/03	$3,600.00
137	Modify BOM/ Layout per Review	2 days	Mon 11/3/03	Wed 11/5/03	$800.00
138	Order Parts/ PCB (5 prototypes)	1 mon	Wed 11/5/03	Wed 12/3/03	$3,300.00
139	Fabricate 5 Prototypes	3 wks	Wed 12/3/03	Wed 12/24/03	$5,500.00
140	Board Level Hardware/ Software Integration	2 mons	Wed 12/24/03	Wed 2/18/04	$24,000.00
141	DVT Testing at Board Level	2 mons	Wed 2/18/04	Wed 4/14/04	$18,400.00
142					
143	Analog Board	1 day?	Wed 4/28/04	Thu 4/29/04	$0.00
144	PCB Layout	2 wks	Thu 10/30/03	Thu 11/13/03	$6,000.00
145	Electrical and Producibility Review of Layout	2 days	Thu 11/13/03	Mon 11/17/03	$3,600.00
146	Modify BOM/ Layout per Review	2 days	Mon 11/17/03	Wed 11/19/03	$800.00
147	Order Parts/ PCB (5 prototypes)	1 mon	Wed 11/19/03	Wed 12/17/03	$3,300.00



Project: Generation 2 Reader
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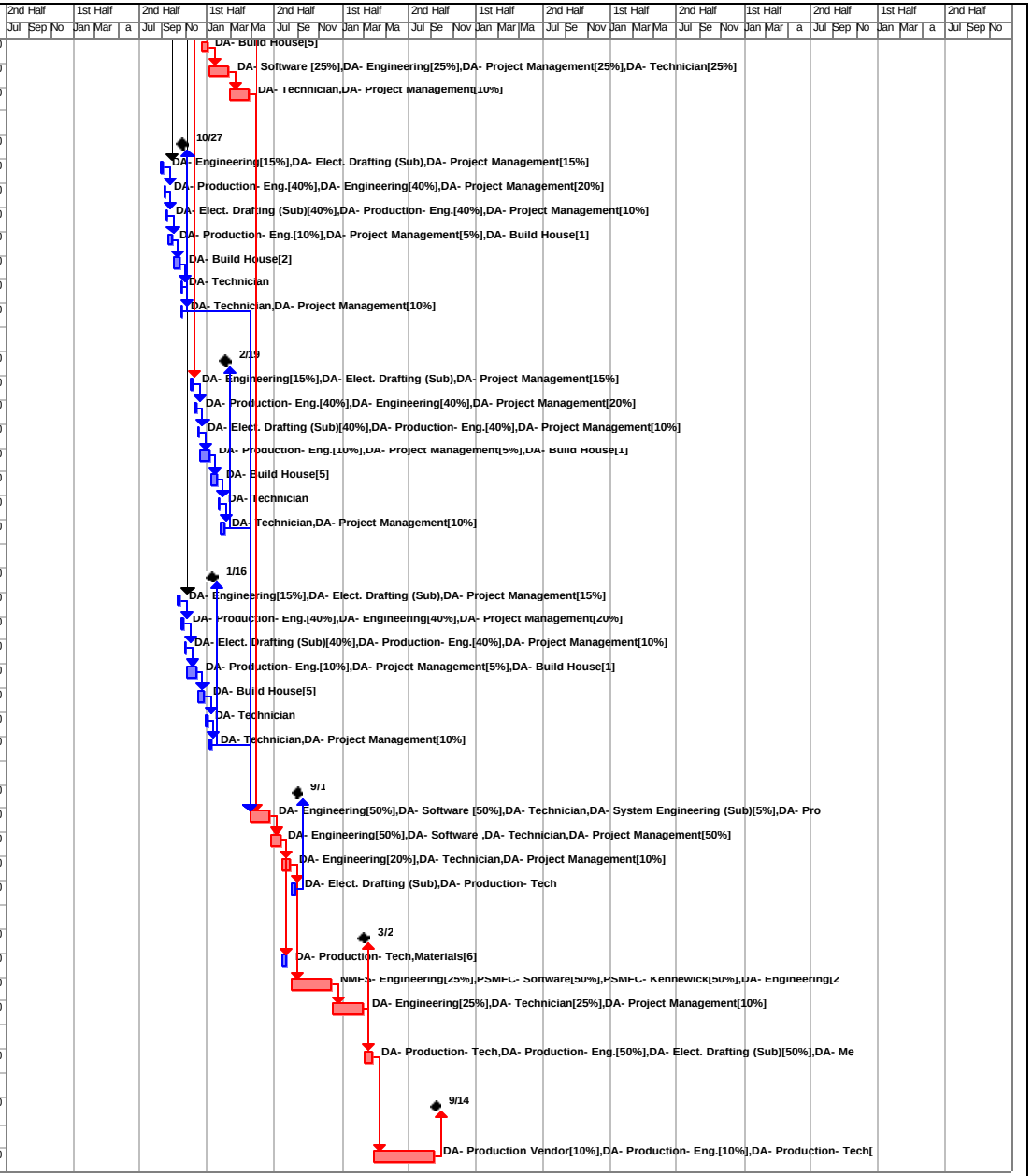
Task
Critical Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Critical Task
Rolled Up Milestone
Rolled Up Progress
Split
External Tasks
Project Summary
Group By Summary

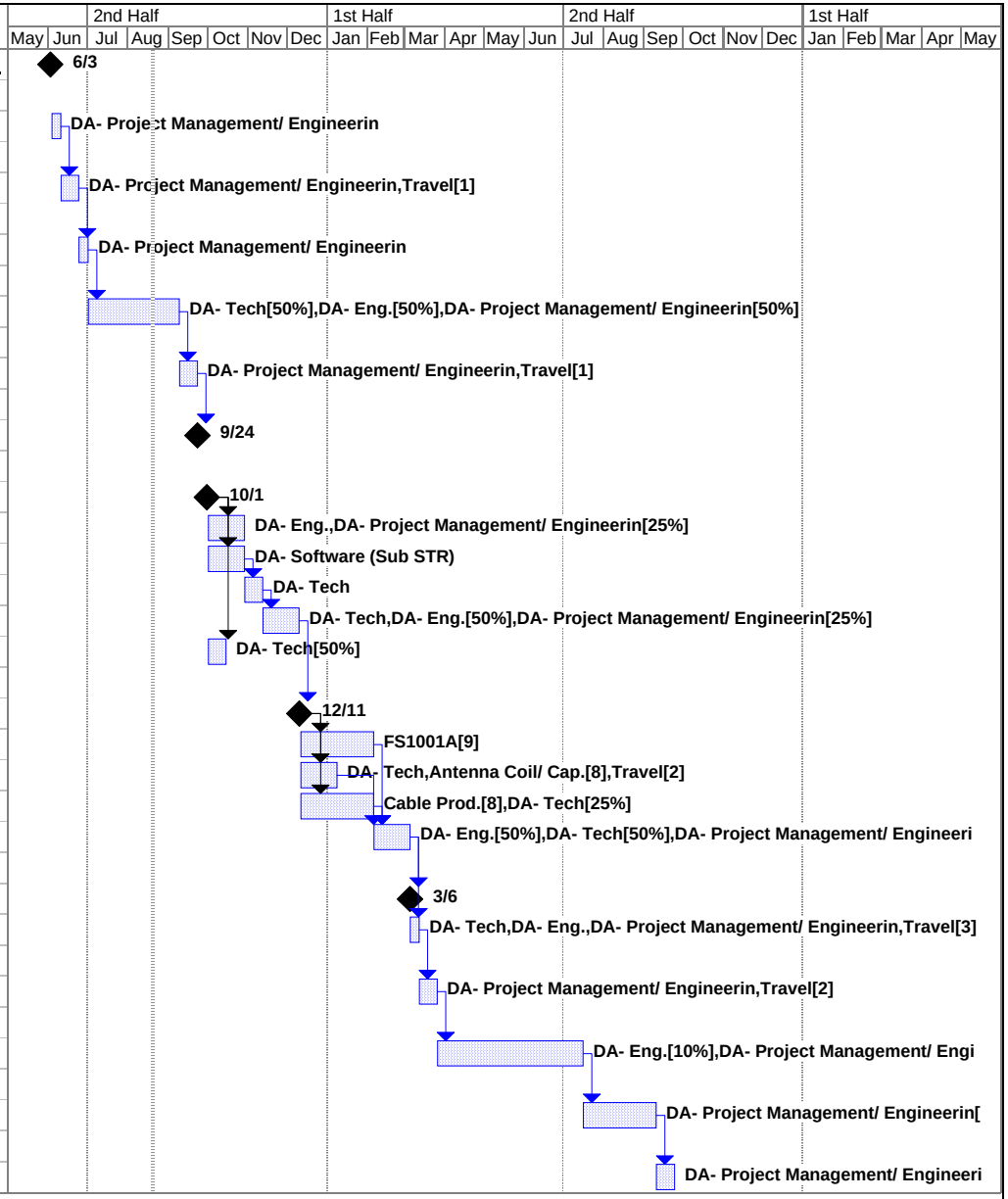
ID	Task Name	Duration	Start	Finish	Cost
148	Fabricate 5 Prototypes	3 wks	Wed 12/17/03	Wed 1/7/04	$5,500.00
149	Board Level Hardware/ Software Integration	2 mons	Wed 1/7/04	Wed 3/3/04	$24,000.00
150	DVT Testing at Board Level	2 mons	Wed 3/3/04	Wed 4/28/04	$18,400.00
151					
152	Primary Communication Card (Fiber Optic)	1 day?	Mon 10/27/03	Tue 10/28/03	$0.00
153	PCB Layout (if necessary)	1 wk	Fri 8/29/03	Fri 9/5/03	$3,900.00
154	Electrical and Producibility Review of Layout	3 days	Fri 9/5/03	Wed 9/10/03	$1,800.00
155	Modify BOM/ Layout per Review	3 days	Wed 9/10/03	Mon 9/15/03	$1,620.00
156	Order Parts/ PCB (5 prototypes)	2 wks	Mon 9/15/03	Mon 9/29/03	$2,400.00
157	Fabricate 5 Prototypes	3 wks	Mon 9/29/03	Mon 10/20/03	$2,500.00
158	Board Level Hardware Integration	3 days	Mon 10/20/03	Thu 10/23/03	$1,200.00
159	DVT Testing at Board Level	2 days	Thu 10/23/03	Mon 10/27/03	$920.00
160					
161	Display/ Keypad/Keyboard Interface	1 day?	Thu 2/19/04	Fri 2/20/04	$0.00
162	PCB Layout (if necessary)	2 wks	Thu 11/13/03	Thu 11/27/03	$7,800.00
163	Electrical and Producibility Review of Layout	1 wk	Thu 11/27/03	Thu 12/4/03	$3,000.00
164	Modify BOM/ Layout per Review	1 wk	Thu 12/4/03	Thu 12/11/03	$2,700.00
165	Order Parts/ PCB (5 prototypes)	4 wks	Thu 12/11/03	Thu 1/8/04	$3,300.00
166	Fabricate 5 Prototypes	3 wks	Thu 1/8/04	Thu 1/29/04	$5,500.00
167	Board Level Hardware Integration	1 wk	Thu 1/29/04	Thu 2/5/04	$2,000.00
168	DVT Testing at Board Level	2 wks	Thu 2/5/04	Thu 2/19/04	$4,600.00
169					
170	Sensor Card	1 day?	Fri 1/16/04	Mon 1/19/04	$0.00
171	PCB Layout (if necessary)	2 wks	Fri 10/10/03	Fri 10/24/03	$7,800.00
172	Electrical and Producibility Review of Layout	1 wk	Fri 10/24/03	Fri 10/31/03	$3,000.00
173	Modify BOM/ Layout per Review	1 wk	Fri 10/31/03	Fri 11/7/03	$2,700.00
174	Order Parts/ PCB (5 prototypes)	4 wks	Fri 11/7/03	Fri 12/5/03	$3,300.00
175	Fabricate 5 Prototypes	3 wks	Fri 12/5/03	Fri 12/26/03	$5,500.00
176	Board Level Hardware Integration	1 wk	Fri 12/26/03	Fri 1/2/04	$2,000.00
177	DVT Testing at Board Level	2 wks	Fri 1/2/04	Fri 1/16/04	$4,600.00
178					
179	System Integration	1 day?	Wed 9/1/04	Thu 9/2/04	$0.00
180	Integrate Hardware/ Software	2 mons	Wed 4/28/04	Wed 6/23/04	$48,400.00
181	Modify Software/ Hardware	1 mon	Wed 6/23/04	Wed 7/21/04	$36,000.00
182	DVT Testing	1 mon	Wed 7/21/04	Wed 8/18/04	$11,600.00
183	Update Schematics/ BOM's	2 wks	Wed 8/18/04	Wed 9/1/04	$10,000.00
184					
185	Field Testing at Pasco/ Abernathy	1 day?	Wed 3/2/05	Thu 3/3/05	$0.00
186	Fabricate Test Antennas (PVC)	2 wks	Wed 7/21/04	Wed 8/4/04	$7,000.00
187	Evaluate Prototype Performance (Multiple/ Max. Size)	4 mons	Wed 8/18/04	Wed 12/8/04	$62,000.00
188	Modify/ Optimize System/ Components	3 mons	Wed 12/8/04	Wed 3/2/05	$13,600.00
189					
190	Update Drawings/ Schematics/ BOM's/ Software Documentation	1 mon	Wed 3/2/05	Wed 3/30/05	$34,000.00
191					
192	**Production**	1 day?	Wed 9/14/05	Thu 9/15/05	$0.00
193					
194	Build and Deliver 4 Production Systems (4 Coil) Transcievers	6 mons	Wed 3/30/05	Wed 9/14/05	$72,800.00



Project: Generation 2 Reader
Date: Mon 6/3/02

Task | Critical Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Critical Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | Group By Summary

ID	Task Name	Duration	Start
1	**Hi-Q PIT Detection - Corner Collector**	**0 days**	**Mon 6/3/02**
2			
3	Review Spec. Doc./ Schedule	5 days	Tue 6/4/02
4			
5	Present Info. On PIT Tag Technology	2 wks	Tue 6/11/02
6			
7	Provide comments/ suggestion to spec./ plan	1 wk	Tue 6/25/02
8			
9	Technical Implementation Evaluation	2.5 mons	Tue 7/2/02
10			
11	Prepare Presentation for Electronics Aprroach to Hi-Q	2 wks	Tue 9/10/02
12			
13	**GO- NO GO**	1 day?	Tue 9/24/02
14			
15	Prototype Development	1 day?	Tue 10/1/02
16	FS1001A-mods	1 mon	Wed 10/2/02
17	Software changes per Skalski	1 mon	Wed 10/2/02
18	Test and Integration	2 wks	Wed 10/30/02
19	Antenna Design	1 mon	Wed 11/13/02
20	Cable Design	2 wks	Wed 10/2/02
21			
22	Prototype Build	1 day?	Wed 12/11/02
23	FS1001A+	2 mons	Thu 12/12/02
24	Antenna Build	1 mon	Thu 12/12/02
25	Cable Build	2 mons	Thu 12/12/02
26	Design Verification Test	1 mon	Thu 2/6/03
27			
28	Field Test	1 day?	Thu 3/6/03
29	Test Prototype at Pasco	5 days	Thu 3/6/03
30			
31	Installation of Hi-Q System	2 wks	Thu 3/13/03
32			
33	Electronic Evaluation/ Plan	4 mons	Thu 3/27/03
34			
35	Analyze Data and Prepare Report	2 mons	Thu 7/17/03
36			
37	Attend FFDRWG Meeting/ Presentation	2 wks	Thu 9/11/03



Project: HI-Q_3year
Date: Tue 8/20/02

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline