PTAGIS

PIT Tag Information System
Columbia Basin

Newsletter

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The PTAGIS Newsletter is published periodically by Pacific States Marine Fisheries Commission.

We welcome input from the PTAGIS community, so email us at ptagis_newsletter@ptagis.org with your story ideas.

If you have questions regarding the contents of this publication, or about the PTAGIS program, please contact PTAGIS Staff.

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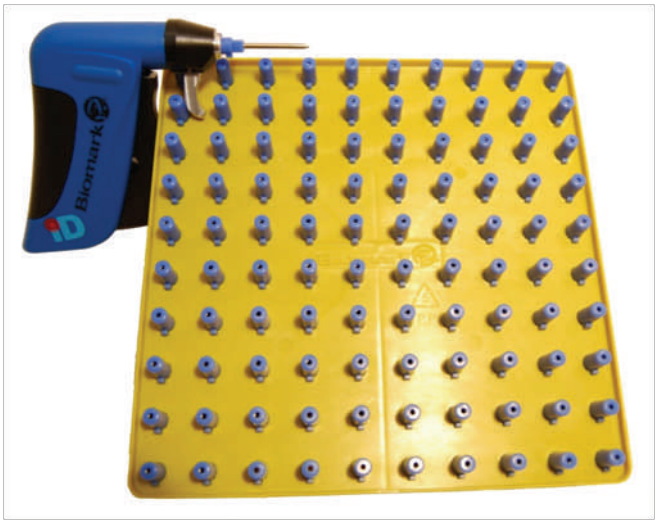
A Fisheries Data Project of the Pacific States Marine Fisheries Commission

IN THIS ISSUE

Preloaded PIT Tags Have Arrived

SHARON GRANT (Bonneville Power Administration)



Five years ago, a need was identified within the Columbia Basin fisheries community for a more efficient way to PIT tag juvenile to adult fish. Since then, Biomark, Inc. has developed a new product that is now available for large-scale use this coming year. Additional information on their product development and research findings can be found on Biomark's website. They have also attached a video demonstrating the use of preloaded tags.

Disclaimer: Bonneville Power Administration (BPA) has not substantiated Biomark's claims for efficiency.

The BPA Fish and Wildlife Program is working with Biomark to make these 12.48 mm preloaded tags available (in units of 100) on a limited basis for their projects wishing to test this new product. We plan to pre-order a quantity of preloaded tags and will make them available upon request by early 2010.

Considerations

Fish health risks. Preloaded tagging needles are single use, and therefore, should reduce health risks associated with dull needles and cross contamination.

Personnel safety issues. Tag loaders and taggers sticking themselves with reusable needles can elevate the risk of exposure to bloodborne pathogens between workers.

Labor issues. Preloaded needles significantly reduce the number of personnel (needle loaders) and the associated labor costs on tagging projects.

Flexibility within the project/contract budget to absorb the cost. The contractor must be able to adjust their budget within their project's allocation to absorb any additional costs. This could possibly result from a reduction of needle-loader personnel and associated travel costs, reduced costs for certain tagging supplies, or additional funds available in the project-level budget.

Cost factors. This fiscal year's costs for preloading will be an estimated $0.31 above the $1.80 price of the 12.48 mm tag. Required implant guns are currently available from Biomark, priced at $70 per Implanter. Another optional cost for mass tagging operations will be one tray clamp per tagging station to stabilize the tray for hands-free operation. This will be offered by Biomark for around $50 each by the beginning of the spring season.

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Obtaining preloaded tags for spring 2010.

First, contact your BPA Contracting Officer's Technical Representative (COTR) to determine whether there is any flexibility within your existing budget. If you and your COTR determine there is sufficient flexibility and you would like to obtain preloaded tags, please contact Sharon Grant (sdgrant@bpa.gov, 503-230-5215) at BPA to communicate your interest or request for additional information.

Requests for tags will be processed on a first come, first served basis.

Obtaining required injector guns and optional tray clamps.

Contact Biomark directly for these items as you would normally obtain other tagging supplies. Biomark may be contacted at (208) 275-0011 or email kirstyn.mckay@biomark.com.

SPECIAL NOTICE: 20mm PIT Tag Production Has Been Dropped

SHARON GRANT (Bonneville Power Administration)

Bonneville Power Administration (BPA) has received notification from our current supplier, Destron Fearing, that they have taken the TX1420SST - 20 mm PIT tag out of production.

Those with BPA projects who have requested 20 mm tags for the current fiscal year will have the choice of:

1) Using Destron Fearing's 23 mm PIT tag, in stock (but also out of production), or:

2) Switching their order to the TX1400SST - 12 mm tag.

If you need more information about your current order status, please contact Sharon Grant, BPA PIT Tag Coordinator (sdgrant@bpa.gov, 503-230-5215).

2009 Season Wrap-Up

ALAN BROWER AND DARREN CHASE (PTAGIS Kennewick Field Office)

As in previous years, the juvenile fish bypass facilities on the Snake and Columbia rivers began operating on or before April 1, 2009. Prior to these operations, the PTAGIS Kennewick staff performed all the necessary pre-season tuning and maintenance to ensure peak performance of the juvenile fish detection and diversion equipment.

The efficiency of the diversion gates at the separation-by-code interrogation sites improved due to the implementation of new Programmable Logic Controller (PLC) programs and the addition of optical sensors. Another benefit of the PLC improvements is that the number of mechanical gate failures (and the number of unscheduled site visits) decreased significantly.

The following table shows the number of PIT tags detected and the average diversion efficiency for the Snake and Columbia River juvenile fish bypass systems as of October 2009. The totals were determined by the number of detections through the full flow monitors for all sites with the exception of Lower Granite: (A separator + B separator antenna groups) which does not yet have a full flow antenna group. The diversion gate efficiencies were taken from the Diversion Gate Efficiency (DGE) report.

Site	PIT Tags Detected	Diversion Gate Efficiency
Lower Granite	225,552	98%
Little Goose	231,386	97%
Lower Monumental	136,701	97%
Ice Harbor	60,752	N/A
McNary	231,665	100%
John Day	84,134	99%
Bonneville	66,642	96%

With the addition of the Little Goose full flow monitor this year, PTAGIS has now installed and maintains six full flow systems. Attention to detail during the installation process and strict adherence to maintenance procedures allow these systems to operate at high efficiencies throughout the year. The adult detection systems continue to operate at high efficiencies. There were no new adult detection systems installed during the 2008-2009 winter. Winter maintenance activities included in-ladder antenna inspections and the repair of broken conduit straps as needed.

The data collection platforms at all sites have been upgraded with higher capacity uninterruptible power supplies (UPS) to cover power outages lasting up to an hour. At Bonneville Dam, each full flow detector in the juvenile fish bypass system, and each slot detector at the Bradford Island and Washington Shore fish ladders, is now protected by its own UPS to help ensure continuous data collection capabilities at these critical fish passage paths. Similar UPS deployments are planned for the full flow and adult slot detectors at the other interrogation sites maintained by the PTAGIS-Kennewick staff.

The diligence of the PTAGIS-Kennewick staff, and their adherence to strict maintenance procedures and schedules, resulted in minimal disruption to either PIT tag detection or separation-by-code diversion during 2009 due to equipment failure.

Attention PIT Tag Manufacturers

Request for PIT Tags for Evaluation

The Bonneville Power Administration (BPA) has requested that National Marine Fisheries Service (NMFS) and Pacific States Marine Fisheries Commission (PSMFC) conduct a tag evaluation to determine the quality of different manufacturers' ISO FDX-B 12-mm tags. This is an informational evaluation; it would only be one factor in determining what tags are purchased by BPA.

Now that the PIT tag detection system has been installed into the corner-collector flume at the Bonneville Dam Second Powerhouse, we want to learn what tags are available that would be detected well (minimally ≥ 50%) in PIT-tagged fish or drones passing through its 17 ft by 17 ft (outside dimensions) antenna. Other tests would be conducted in a laboratory.

Before a full evaluation is conducted, there would be some preliminary tests to confirm that the tag reading performance minimally meets the performance level of the 12-mm tag that is currently being used by the fisheries community within the Columbia River Basin (model TX1400SST by Destron Fearing). All tests will utilize Destron Fearing transceiver models paired with appropriately-sized antennae.

If you are interested in participating, please contact Dr. Sandra Downing from at NOAA Fisheries (206-860-5604 or sandy.downing@noaa.gov**).**

2009 PTSC Annual Meeting

JENNIFER NIGHBOR (PTAGIS Kennewick Field Office)

The PIT Tag Steering Committee (PTSC) Annual Meeting was held at the Pacific States Marine Fisheries Commission (PSMFC) office in Sellwood on February 24, 2009.

Steve Pastor was elected the new PTSC Chairman.

Meeting minutes may be found at PTSC 2009.

The goal of the Committee is to coordinate implementation of PIT tag tagging and interrogation systems and to provide a comprehensive PIT tag database accessible to all interested parties in the Columbia River Basin. The purpose of the Committee is to:

- Provide technical guidance for the field tagging, interrogation facilities and data management of the PIT Tag Operations Center.
- Provide feedback to the PSMFC Executive Director for annual performance review of the PTOC.
- Coordinate training for taggers and other field personnel involved with the PIT tag tagging system as needed. Facilitate implementation of standardized tagging techniques to ensure high quality marking.
- Establish system specifications and update annually to assure integrity and continuity of the data.
- Provide coordinated recommendations to appropriate agencies on activities and programs that further the Committee's goals.
- Identify and forward policy issues to FPAC (Fish Passage Advisory Committee) for resolution through CBFWA (the Columbia Basin Fish and Wildlife Authority).

Please see the PTAGIS wiki for more information on the PIT Tag Steering Committee.

Computer Upgrades at Field Locations

ALAN BROWER (PTAGIS Kennewick Field Office)

Between the Fall of 2008 and the Spring of 2009, the MiniMon data collection computers were replaced at all of the non-SbyC interrogation sites operated by PTAGIS.

Twenty-two Windows 98 PCs were replaced with new Dell Optiplex PCs running Vista Business.

Many of the old PCs were rebuilt and stocked in Kennewick for use at Separation by Code (SbyC) sites. They were given new hard drives, fans and power supplies. Software was loaded such that they would be ready for quick deployment in the event of a MultiMon data collection PC failure. Also during this time, all of the data collection platform monitors were upgraded. Fifty-seven obsolete CRT monitors were replaced with Dell flat panel LCD monitors.

With BPA approval, all hardware that could not be reconditioned was disposed of at certified recycling centers.

Figure 1. Old Computer Data Platform

Figure 2. New Computer Data Platform

Little Goose Full Flow Completion

ALAN BROWER (PTAGIS Kennewick Field Office)

Four PIT tag detectors were installed in the full flow bypass flume at Little Goose Dam this year. Construction commenced in late 2008 and the detectors were operational on March 26, 2009. This is the sixth full flow detection system installed to-date at a hydroelectric project on the Lower Snake and Columbia rivers.

Previously, researchers could only collect PIT tag data in the dam's Juvenile Fish Facility (JFF). The JFF operates during the juvenile fish passage season from April 1 through October 31. PIT-tagged fish that were previously by-passed around the JFF starting on October 31 can now be interrogated through out the rest of the season.

As with other smolt bypass sites, the full flow detectors at Little Goose Dam bypass provide researchers with additional data that would otherwise be unavailable when the juvenile fish facility was inactive.

DF 2020 Reader Evaluation

Darren Chase (PTAGIS Kennewick Field Office)

In July, 2008 Destron Fearing (DF) provided a prototype transceiver (Model 2020) which has been suggested to be a direct replacement for all three types of transceivers deployed by PTAGIS in the juvenile and adult passage facilities at mainstem dams in the Columbia Basin. PTAGIS was asked to evaluate the performance of the DF2020 transceiver in three main areas of operation: the juvenile fish bypass facilities, the orifices in adult fish ladders, and the larger slot detectors in some of those ladders.

Test evaluations were performed in the field as well as in the PTAGIS-Kennewick test lab. The goals and objectives of these evaluations were to test the DF2020 and compare the results with the same transceiver type.

Over the next several months the DF2020 was installed in the field on various types of adult detection systems, testing all the different antenna types, as well as running controlled environment tests in the Kennewick lab using simulated juvenile and adult detection systems. The field testing was conducted in such a manner as to see how well the reader would perform in climates with large temperature swings, locations that exhibit higher than normal noise conditions, and locations with extremely long cable runs (75 ft- 200 ft).

The DF 2020 was able to prove itself as a viable replacement for the Columbia Basin detection systems but not without modifications to the reader. This prompted PTAGIS, in conjunction with Destron Fearing, to begin writing a Reader Modifications document that was completed in July 2009.

Since July, Destron Fearing has been working on the implementation of the modifications to the DF2020 and as a result the first completed prototype units are set to be delivered to PTAGIS-Kennewick in early of 2010.

Klickitat Project

Alan Brower (PTAGIS Kennewick Field Office)

The Yakama Nation (YN) requested that PTAGIS assist in the implementation of new PIT tag interrogation sites on the Klickitat River. Design work is underway for projects at the Lyle Falls and Castile Falls fishways. More YN PIT tag installations on the Klickitat are being planned.

Both Lyle Falls and Castile Falls are being transformed into research facilities. PIT tag detection will be added to fish ladders at both sites. PIT tag detection in new adult fish traps and wet labs will also be implemented, allowing researchers to determine run timing information and other details of fish behavior.

The Lyle Falls area is subject to flooding. In order to prepare for this, the wet lab and its 12 PIT tag antennas are designed into a mobile platform so that it can be moved to higher ground.

Figure 1. Castile Falls

Figure 2. Lyle Falls

Kennewick Field Office Lab Expansion

ALAN BROWER (PTAGIS Kennewick Field Office)

In 2008, PTAGIS Field Operations expanded the lab/shop areas of the Kennewick Field Office.

Lab Data Collection Platforms

The software test platform has expanded. There are now four independent data collection test platforms from which to work. The typical PC1 – PC2 configurations used at interrogation sites have been created for MultiMon and MiniMon as well as a new platform to test M4. A fourth platform has been set up for other testing and production platform assembly.

To exercise the platforms, six juvenile and two adult transceivers are able to stream data to all eight PCs simultaneously. The MultiMon, MiniMon and M4 platforms can also each be fed with 32 channels of emulated transceiver data.

Figure 1. Lab Data Collection Platforms

Transceiver Emulator and Lab Wheel

The transceiver emulator (written by PTAGIS Senior Software Engineer John Tenney in Portland) consists of a PC delivering computer generated tag codes to six Comtrol Device Master (32 channel) Ethernet to RS-232 converters. The 32 outputs from each Device Master are routed to the Comtrol Rocketport expansion chassis that lead to each of the six PCs.

The live data generated by the transceivers plus the emulated transceiver data provides the ability to simulate a 40 transceiver interrogation site simultaneously on the MultiMon, MiniMon and M4 test platforms. This has been/will be used to cross reference performance testing of M4 compared to MultiMon and MiniMon.

Figure 2. Emulator Rocket Ports and Lab Wheel

In the lab, four of the juvenile transceivers drive antenna groups that are typical of what is in use at juvenile interrogation sites. The lab wheel has a 36’ belt that loops through those antenna groups. PIT tags attached to that belt can be moved through the antennas at speeds up to 27’/second to simulate fish traffic at a juvenile site.

In the RF room (a room specially designed to keep out radio frequency noise), two juvenile and two adult transceivers are used to test various antennas and different model PIT tags. Another wheel with a 24’ belt is available in the RF room.

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Automated PIT Tag Test System (APTTS)

The Automated PIT Tag Test System (APTTS) is now housed in a dedicated room. A key to smooth operation of the APTTS is cleanliness, and the room has cut down the amount of dust accumulated. White tiles on the floor make it easier to find the more slippery PIT tags. An air dryer was recently installed and improved filtering on the compressed air to the APTTS.

Another addition this year was the installation of four cameras and a DVR to monitor the APTTS. For times when the APTTS is used during non-business hours, this system allows remote monitoring its activity over the internet. Video of the automated testing is recorded. In the event of an issue, video can be examined to aid in troubleshooting.

Figure 3. APTTS

Mechanical Shop

A larger 1500 square feet mechanical shop has been added. The shop is now spacious enough in which to drive vehicles/trailers/forklifts.

Transceiver Troubleshooting and Repair

PTAGIS has taken on the task of troubleshooting and repairing the transceivers used in our interrogation systems in the Columbia River Basin. In the lab, a dedicated area with the necessary test equipment for transceiver repair has been set up. For troubleshooting temperature induced failures, an environmental chamber has been set up in the shop. It is capable of cycling temperatures from -4°F to 185°F and introducing 40-95% relative humidity to further test for other failures.

Troubleshooting the various boards to component level is the first step. After repair, a transceiver is connected to a test load and burned in for 24 hours. For performance verification, the transceiver is put into service in the test platforms mentioned above. Bi-directional communications are verified at the fiber optic outputs on the transceiver. One of the antennas on either the lab wheel or the RF wheel is connected to the transceiver and tags are tested with 1000 passes at 14 fps. As a final step, timer tag functionality is verified.

Programmable Logic Controller (PLC) Development Area

The Programmable Logic Controller (PLC) development area has been expanded. The PLC development area has the different models of PLCs and Human Machine Interfaces (HMI) that are used in the field. A particular site's PLC code is loaded and a switch box (to simulate the switches at a particular site) is connected to simulate any production Separation by Code (SbyC) site in operation. Also, a virtual slide gate is available for testing purposes.

Figure 4. PLC Development Area

The ability to recreate a site in the lab is useful for troubleshooting and improving existing sites. Bringing M4 SbyC to fruition will require a PLC that communicates via Ethernet. The new PLC is available in the lab and development continues on that front. A new state of the art sequence of events monitor is available. This will timestamp events, with sub-millisecond resolution, showing places for improvement in the interaction of the PLC code and M4 SbyC.

Developing a PIT Tag Detection System for the Ogee Area of the RSW Spillbay at Ice Harbor Dam

SANDRA L. DOWNING (NOAA Fisheries)

Background

The Army Corps of Engineers (Corps) has installed removable spillway weirs (RSW) at Lower Granite, Ice Harbor, and Lower Monumental dams (Figure 1). The RSWs are very efficient at attracting and passing salmonids, including PIT-tagged fish. As a result, detection of PIT-tagged salmonids in the juvenile bypass facilities has decreased. Eric Hockersmith from NOAA Fisheries has estimated from the data collected at Lower Monumental in 2008, that even if the PIT tag detection system for an RSW spillbay were only 50% effective, that it would provide 50% more detection of spring and summer migrants. These additional detections could also potentially provide information on surface passage use, fish behavior, and survival for sockeye, wild stocks, and for various ESUs.

At the February 2009 FFDRWG meeting in Walla Walla, NOAA Fisheries, PSMFC, and Destron Fearing (aka Digital Angel) presented several concepts for antenna designs for different styles of spillbays (i.e., unmodified, modified with TSWs or RSWs). The main objective of the meeting was to try to find a design that would work for spillbays with TSWs or RSWs. During the meeting, the strongest support was for antennas that were buried into the ogee of the spillbay (Figure 2). This design was attractive for several reasons:

1) it would not affect hydraulics;
2) there were no debris issues;
3) the design would permit multiple antennas to be installed across the length of the ogee and therefore reduce the impact of tag collisions;
4) if the area where antennas were to be installed was large enough, then multiple antenna arrays could be installed, which is important from an O&M perspective;
5) water depth was lower than closer to the gate opening; and
6) it could potentially work for all styles of spillbays.

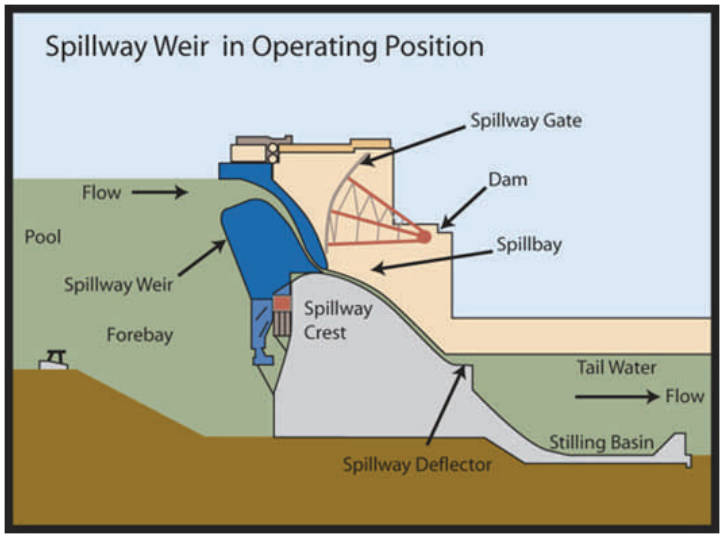

Figure 1. Diagram of an operating RSW. Diagram courtesy of the US Army Corps of Engineers.

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The main disadvantage was that water depth would be at least 3 feet, which was higher than the read distance currently being achieved with in-stream flat-plate antennas. The other was that the water velocity might be close to 90 fps; however, we already knew that it was possible to reduce the time for transmitting the tag telegram as this solution had been discussed several times over the past 10 years with Destron Fearing.

At the meeting, the FFDRWG representatives decided to test an ogee PIT tag detection system at Ice Harbor Dam because the Corps was already planning on making modifications to the ogee area for the RSW spillbay.

Figure 2. Photo of the spillway at Ice Harbor Dam with spill coming out of the RSW Spillbay and the ogee area marked for one of the spillbays.

Proposed antenna designs

With input from NOAA Fisheries, Destron Fearing engineers discussed the problem of designing an array of antennas that could detect fish 2-3' above the ogee at a velocity of 90 fps. They came up with a three prong approach.

1) Evaluate the performance of V-shape antennas that potentially could produce a higher and wider field than flat-plate antennas (Figure 3). However, this design would require around 5' of concrete below the surface of the ogee to be removed.
2) Evaluate a shielded flat-plate antenna design to see if it could detect fish 3' above the ogee surface (Figure 4). This design would only require 18" of concrete to be removed.
3) Test firmware changes to the SST tag and transceivers that would permit the tag telegram to be detected in 16 msec instead of 32 msec. If we need to decrease the telegram down to 8 msec, then this would involve a costly new die to be produced.

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V-Shape Antenna (in the Ogee Area) - Preliminary Proposal

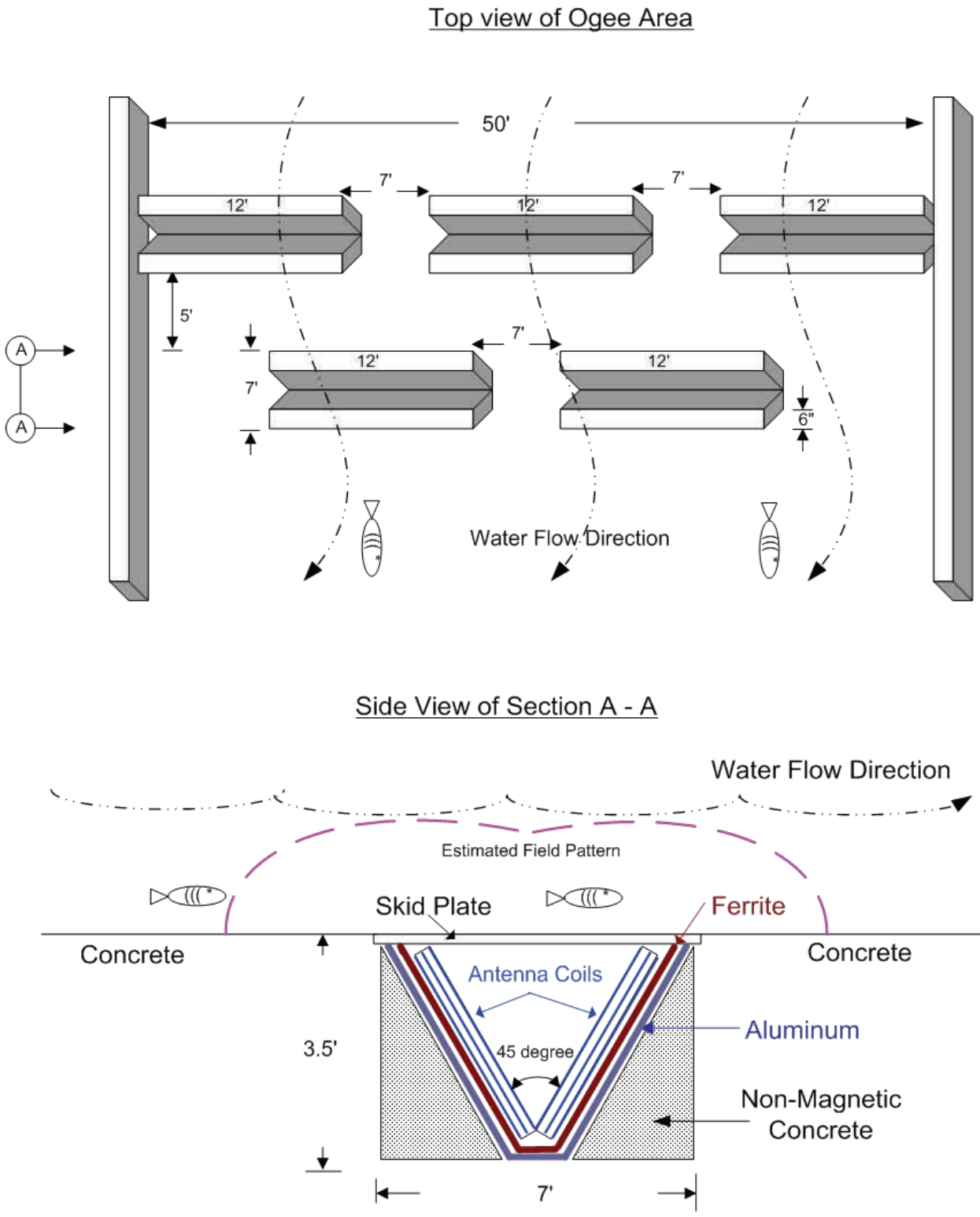

Figure 3. The upper diagram shows the proposed antenna layout using V-shaped antennas. The bottom diagram shows a cross section of the antenna along with the theoretical read-range area marked by the dashed magenta lines.

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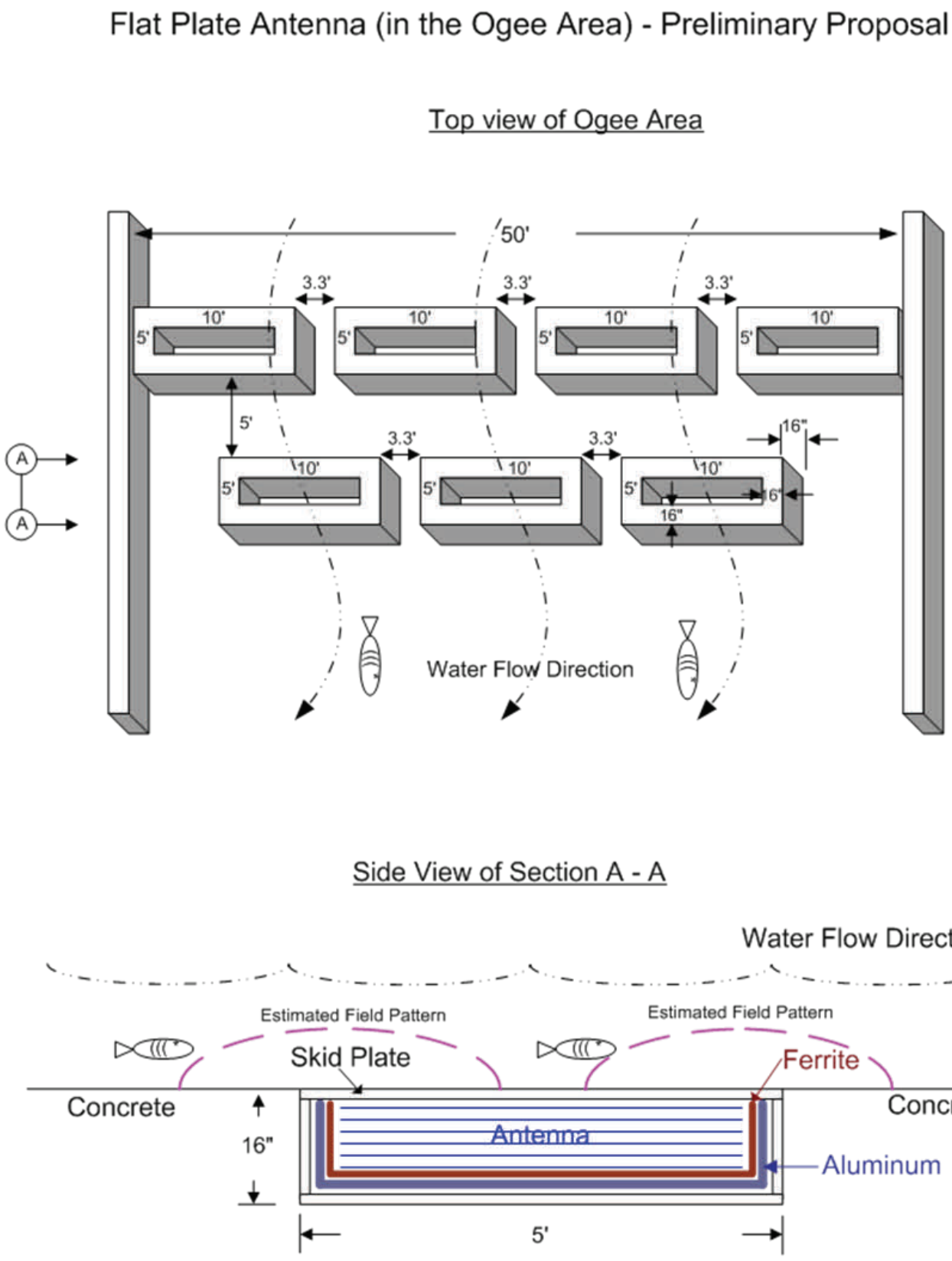

Figure 4. The upper diagram shows the proposed antenna layout using flat-plate antennas. The bottom diagram shows a cross section of the antenna along with the theoretical read-range area marked by the dashed magenta lines.

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Information received from the Corps

NOAA Fisheries and Destron Fearing submitted several questions to the Corps that would help determine the design of the prototype PIT tag system that would be tested at Ice Harbor. The answers provided the following information:

1) That there is no rebar in the concrete below the ogee. This was great news because normally in PIT tag installations, we remove the metal rebar and replace it with fiberglass rebar.
2) They also indicated that it would be fine to remove up to 5' of concrete and therefore, it will be possible to evaluate the V-shape antennas.
3) That with a spillbay containing an RSW vs. a TSW, that most of ogee would be available for antennas. They indicated that possibly 48' of the face of the ogee might be available (48' by the 50' length of the spillbay) at Ice Harbor Dam.
4) The water depth over that area would vary from 3 to 4' and the water velocity was probably in the 62-77 fps range.

In terms of designing a PIT tag system, most of this information was good news. Really only the water depth represented bad news. With the information gained from the Corps, Destron Fearing and NOAA Fisheries think that we will be able to design a system that will have a detection rate significantly higher than 50% unless fish grouping is a major issue.

Schedule

The decision was to install the ogee-based PIT tag detection system at Ice Harbor Dam in time for the 2011 outmigration.

NOAA Fisheries has contracted Destron Fearing to evaluate different antenna designs and to write and test the firmware changes to reduce the tag telegram. The antenna testing will be completed by the end of 2009. It will demonstrate exactly what the read-range window is for each design. The testing will also examine whether the designs can be modified in any way to deal better with multiple tagged fish coming through the spillbay close together. It may be better to choose a design that cannot cover the full 4' of water depth, but can detect fish closer together. With the 48' of ogee face available, we may be able to test different designs in this prototype system.

Starting in January 2010, Destron Fearing, NOAA Fisheries, and PSMFC will meet with the Corps design team to work on designing such items as the skid plates, the grounding scheme, how to run the different cables between the antennas and the transceivers, transceiver housings, and the data-collection system. The Corps will issue a contract at the end of July for the ogee work.

PTAGIS Client Software Update

JOHN TENNEY (PTAGIS Portland Office)

This article provides an update for all PTAGIS client software development activities. The PTAGIS program has reorganized and refocused our efforts to enhance productivity for developing new software systems while maintaining and supporting existing applications.

Last month we added a new member to our development team. Craig White is a senior-level software engineer with several years of professional experience working at places like Intel, Dell and HP. We are leveraging Craig's enthusiasm and expertise with database development to help us upgrade our field data submission technology and server-side reporting.

The following sections describe the status and recent activities for all PTAGIS client software applications.

M4

M4 is the next-generation interrogation software system to replace MiniMon and MultiMon and has been under development the last few years. This software is designed to run unattended at large main-stem interrogation sites operated and maintained by PTAGIS that require Separation by Code (SbyC) and high-availability features. We've also designed this software to support smaller in-stream interrogation sites operating on low-power platforms with features such as configuration change-management (Figure 1) to automatically notify PTAGIS when site equipment has been changed in the field.

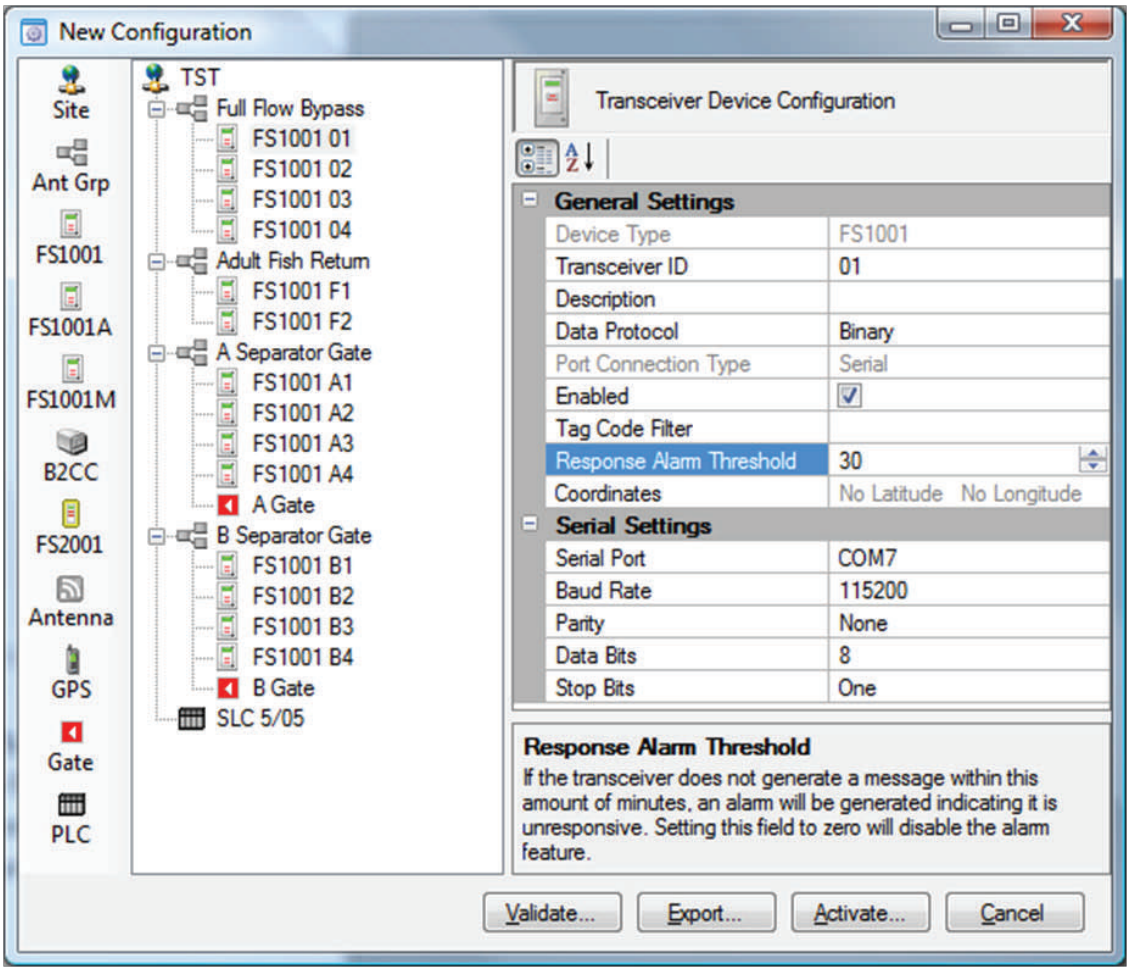

Figure 1. M4 Configuration Management

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Beta versions of this software performing basic monitoring activity (similar to MiniMon) have been released for internal testing last year. PTAGIS decided not to release beta versions of this software to the community until some of the more complex features and components are more fully developed. We are anticipating a production release of M4 next year.

M4 is the highest priority for PTAGIS development staff and this table summarizes some of the current and future development activities grouped by common features of the application:

M4 Feature	Activity
Monitoring	A Windows Service process will perform all data acquisition and automated uploads. The advantages of this background service is that it runs separately from the user interface, allowing it to start automatically and securing it from performance degradation and common run-time errors associated with display. This monitor service was completed some time ago and is continually tested as new features are added to the program.
Dashboard	This is the primary user-interface providing process control, configuration management, and status reporting features. Most of the M4 user interface (dashboard) was developed a few years ago and is currently being updated and optimized to reduce the dependency on multiple frameworks that are no longer viable.
Database	Instead of using text files, M4 uses a local database to store all filed data. This has advantages of transactional support and contiguous relational data for local reporting and submission to PTAGIS. The database access has been recently optimized to support a compact version of Microsoft SQL Server instead of a server-based version. The advantage of the compact database over a server-based version: • Will run on embedded, low-power micro PC platforms • Has a much smaller footprint to ease deployment • Does not require administrator privileges for installation • With a recent 64-bit release, it will be powerful enough to handle the high transactions-per-second volume generated at main-stem sites.
Device Support	M4 supports a variety of transceiver, PLC and GPS devices. The device library is currently being tuned to support the high-performance requirements for SbyC. We are also adding support for a specialized transceiver operating at the Bonneville Corner Collector facility that is currently being monitored by a “one-off” version of MiniMon.
Separation by Code (SbyC)	This is one of the more challenging aspects of M4 development process. These features have been carefully designed, prototyped and analyzed to meet the high performance benchmarks required to successfully divert fish. Currently, we are evaluating off-the-shelf Programmable Logic Controller (PLC) Ethernet drivers communicating from a 64-bit platform. If these drivers perform as expected, it will greatly reduce the SbyC development effort and costs. The backup plan will require an embedded real-time subsystem with custom PLC Ethernet communication and will require the expertise of outside consultants. This system has already been prototyped.
Failover Clustering	M4 has been designed to run optionally as a clustered system to meet the high-availability requirements for sites maintained by PTAGIS. Two computers run M4 and keep each other updated on their status. If one computer fails, we have a second computer to capture data and take over any SbyC operations. This feature was completed last year and tested. We still need to update the user interface and configuration discovery/validation features for the next release of M4.

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M4 Feature	Activity
Data Submission	Field data captured by M4 can be automatically or manually submitted to PTAGIS. Instead of sending text files, relational data will be transferred to a staging database at PTAGIS HQ and then converted to traditional text files to support existing infrastructure. Eventually this data will be migrated to a new reporting server -- separating transactions from reporting to improve performance and provide additional features. The last internal beta release of M4 included a prototype of the submission system that performed very well. We are upgrading this feature for production usage and will be evaluating it for performance and scalability.
Remote Site Support	M4 will provide support for sites that cannot be connected to the Internet or, due to power limitations, do not have a data-collection computer. For sites able to operate a computer, M4 can auto-export data on a defined schedule to a portable media drive. Data can be imported from the media into another M4 installation that is connected to the Internet so that it can be uploaded to PTAGIS (similar to MobileMonitor/MobileSync Manager). For sites unable to operate a computer, M4 Dashboard will support direct downloading of data from multiple transceivers sharing a common serial port. M4 will also support importing data output from a CR1000 data logger.

P3

P3 is a software application developed by PTAGIS to collect PIT tag mark, release and recapture information. The last release of this software, version 1.4.5, has proven to be stable and no features or upgrades are planned at this time. This software will eventually be replaced by P4. We've been asked by researchers of the community if this software will run on Window 7. We currently do not have the resource to test this but we are reasonably sure P3 and MiniMon will be compatible with Windows 7. If there are any issues please contact us and we will correct them as soon as possible.

Importing Lower Case Rearing-Type Codes

One issue with version 1.4.5 that was discovered last summer is that P3 will allow the importing of lower-case rearing -type codes from external files, bypassing validation. PTAGIS requires all rearing-type codes to be upper-case. As a workaround, please scan your source files before importing and update as necessary.

Support for SysScan-ID LiveTrack Reader

PTAGIS verified that P3 can support SysScan-ID's LiveTrack reader by selecting and configuring the FS1001F portable reader. You can download instructions for using this reader by visiting the P3 Hardware page on the PTAGIS web site.

P4

P4 is the next generation tagging software to replace P3. Our small but capable staff is presently dedicated to the development and release of M4. To date, no work has been committed or scheduled for P4. Components developed for M4, such as Data Submission, will be reused for P4 and will expedite the development process. We've captured requests to add additional data types, support for hand-held platforms and other types of devices. When the M4 release schedule is firm, we will post an online questionnaire for the PTAGIS community to complete. This questionnaire will help us refine requirements and identify new ideas to include in this software. From there, we will work with our PIT Tag Steering Committee members to assemble a focus group to review requirements and help test the application.

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MiniMon

MiniMon was developed by PTAGIS in 1999 to support interrogation sites that do not require Separation by Code. MiniMon will be replaced by M4 and no upgrades to this software are scheduled at this time. Similar to P3, MiniMon should run on Windows 7 without issue with the potential for a security permission issue on restart that can occur if a Vista (or Windows 7) computer is not shutdown properly (power plug is pulled). We strongly recommend using an Uninterruptible Power Supply (UPS) at all production data collection sites to prevent this issue as well as serious hardware damage occurring from hard shutdowns.

FS1001M Firmware 2.0

MiniMon version 1.5.3 was released last April to support the Destron-Fearing FS100M multiplexer transceiver firmware version 2.0. This firmware has not been released to the community as of yet. The manufacturer is anticipating a release date at the end of November which will include an updated manual and release notes. We will work with Destron Fearing to post an announcement to the community when the firmware is ready for installation. You will be able to download the firmware from Destron Fearing's FTP site by following these directions:

Open a web browser and navigate to ftp://df-ftp.com

Enter user name **dafisheries08** and password **PITTag08**.
Select the **FS100M Multiplexer** folder
From there, download the firmware, VBFlash installer, instructions, release notes and updated manual.
Read the VBFlash instructions for flashing FS1001M transceiver firmware.

Important: MiniMon 1.5.3 only supports versions 1.7 and 2.0 of the FS1001M firmware. There were a few versions of 1.9 firmware released to the community that were difficult to identify and support. If you are running any of these versions, you can try downloading and running MiniMon version 1.5.1 (ftp://ftp.ptagis.org/Software/MiniMon/Past%20Versions/MiniMon151.exe) until version 2.0 firmware is released.

PIT TAG File Formatter

Last summer PTAGIS released utility software called PIT Tag File Formatter (PIFF) to help researchers support remote sites that are not using a data collection computer. PIFF will import raw data downloaded from a transceiver buffer or data captured by a CR1000 data logger device. PIFF will transform and format these raw data into a standard interrogation data file that can be submitted to PTAGIS.

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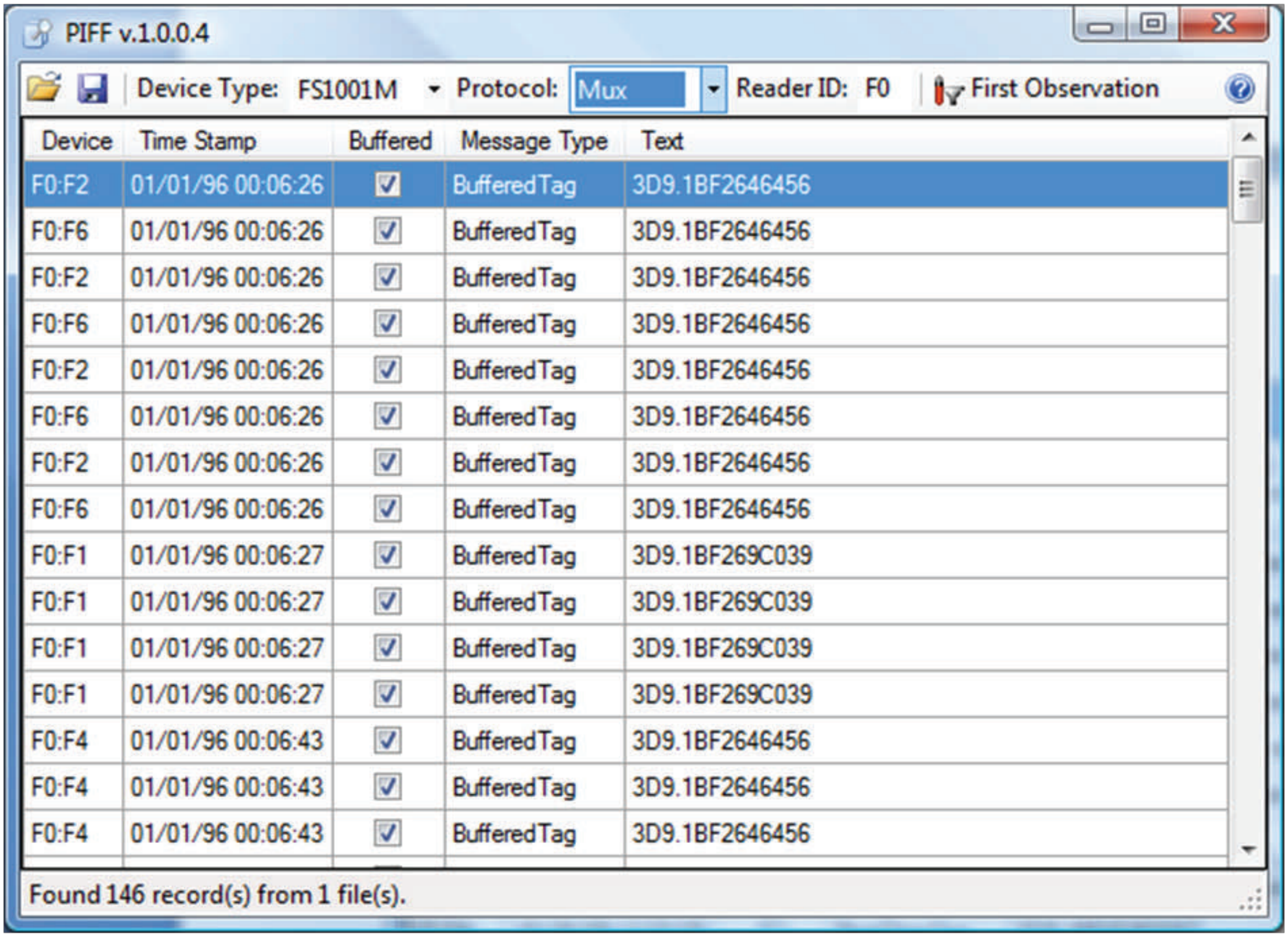

Figure 2. PIFF Utility Software

This installer for this software can be downloaded from the PTAGIS ftp site (ftp://ftp.ptagis.org/Software/PIFF/PIFFInstaller1004.exe). The PIFF software includes online help.

Malformed Tags

A recent issue was discovered with PIFF that allowed malformed tags (tag codes with extra digits) output from a data logger or transceiver to be passed into an interrogation file. This validation issue is being resolved in a shared component of M4 and we will make a new release of PIFF as soon as possible.

MobileMonitor

This software was developed by PTAGIS to support interrogation sites running on Windows Mobile or Pocket PC PDAs. PTAGIS is no longer supporting this software for a variety of reasons mentioned in a previous newsletter article. This software is still available for researchers to download and use from the PTAGIS web site. When released, M4 will support embedded Micro-PCs as an alternative, low-power platform.

Status Report on the Development of a New Multiplexing FDX-B PIT Tag Transceiver

Sandra L. Downing, Bruce Jonasson, and Gabriel Brooks (NOAA Fisheries)

Background

There is great need for information on salmonids during the freshwater life stages, for both juveniles during rearing and migration and for mature fish returning to their natal streams. This need is reiterated in numerous biological opinions and recovery plans for threatened and endangered salmonids, some of which explicitly ask for PIT tags to be used for collecting this information.

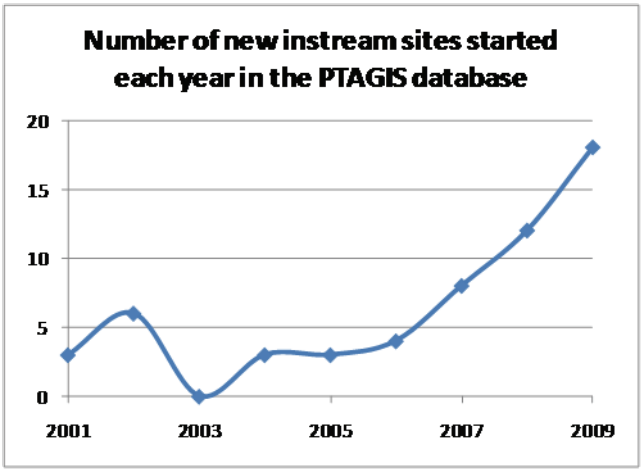

Figure 1. Graph showing the number of new instream sites started each year in the PTAGIS database.

Since 2001, PIT tag technology has been used in streams and small rivers in the Columbia River Basin to monitor fish presence and behavior, evaluate the effectiveness of stock restoration projects, and address various other research objectives. Instream PIT tag interrogation systems enable researchers to assess fish behavior and population dynamics under more natural conditions. The instream sites are expanding rapidly; currently, there are over 50 instream sites in the PTAGIS database with 18 of them new in 2009 (Figure 1).

These instream sites mostly use the FS1001M developed by Destron Fearing (aka Digital Angel) as an interim product in 2002-2005. The FS1001M transceiver operates up to six antennas by switching from one antenna to another in a programmable sequence. This allows the entire span of many streams to be covered or multiple antenna arrays to be installed in a single stream. The FS1001M multiplexing transceiver has enabled investigators to use instream PIT tag monitoring systems to address numerous biological questions. Researchers have developed innovative uses for these systems; however, there is still a need for additional transceiver function and the FS1001M transceiver cost is high. Furthermore, none of its components were designed specifically for the demands of instream use. This is also true for the Allflex and Texas Instrument PIT tag systems that instream researchers are using.

To allow further advances in instream PIT tag interrogation, one or more new transceivers need to be designed specifically for use in streams and rivers. Multiple transceiver designs are needed for the different types of instream applications currently being pursued to meet the data needs of fishery resource management. These range from applications using single antennas (e.g., 2.5-3 m long) to monitor numerous small tributaries or modified culverts to those using multiple large antennas to monitor behavior and directionality in major rivers.

New multiplexing transceiver

In 2006, National Marine Fisheries Service (NMFS or NOAA Fisheries) led a multi-agency team to develop a list of requirements needed for a new multiplexing transceiver to replace the FS1001M. Based on the requirements document, NOAA Fisheries issued a contract to Digital Angel in 2007 to develop a new multiplexing transceiver that would enable them to monitor fish in small to larger sized rivers. Like the current FS1001M transceiver, the new transceiver must be able to keep the antennas tuned as environmental conditions (e.g., water levels) change, consume low power, and control the multiple antennas needed to span the entire width of these rivers.

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The requirements document also indicated the need for simpler antenna designs and for adapting the transceiver for estuarine applications. The goal was to have a system that was simple to install and maintain.

Destron Fearing proposed a modular design (Figure 2) that would consist of a Master Controller (MC) that communicated to each Antenna Controller Node (ACN) and saved their data to a removable storage card and had the ability to communicate that data "real time" via various paths to a host computer. Each ACN would control its own antenna and could be up to 1,000 feet away from the MC. The original concept was that the ACNs would be low-cost units that were installed inside the antennas to maximize performance.

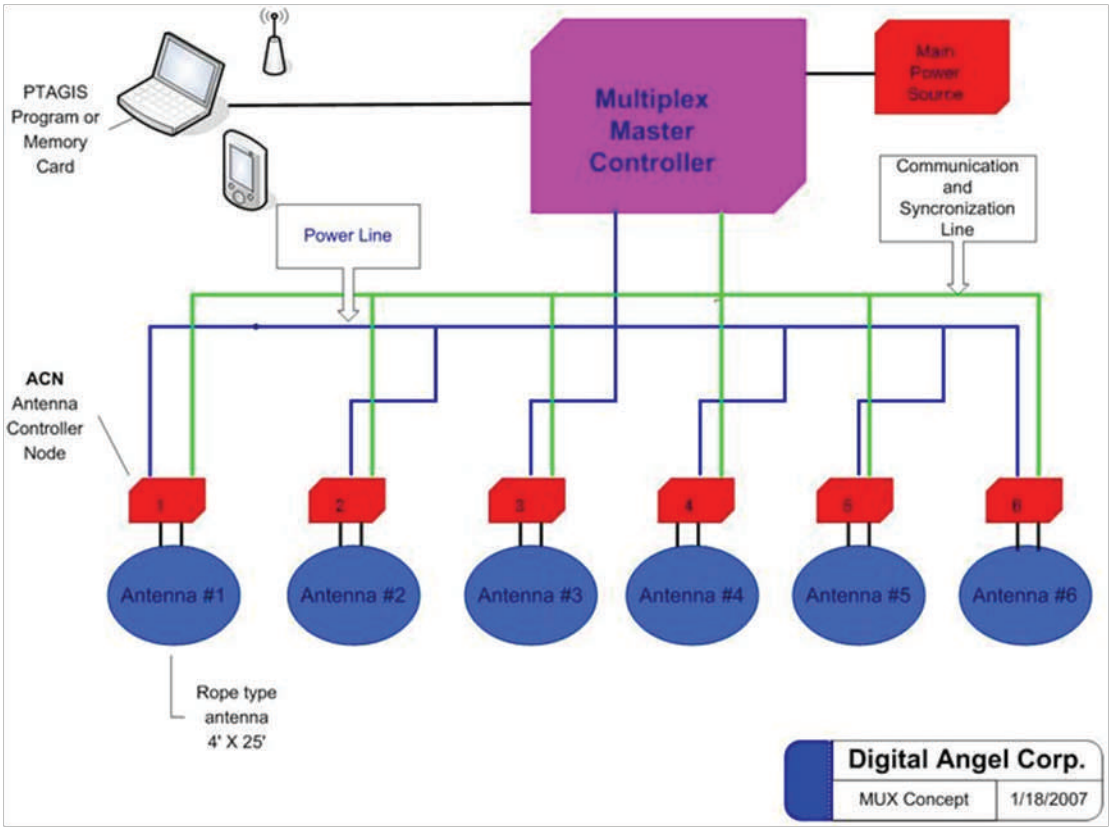

Figure 2. Modular design proposed by Destron Fearing (aka Digital Angel Corp) for a new multiplexing transceiver. Design would consist of one Master Controller (MC) and multiple Antenna Controller Nodes (ACN).

In February 2008, NOAA Fisheries received the first ACN prototype. NOAA Fisheries, PSMFC, and Biomark evaluated the prototype. The ACN performed better than the FS1001M in electronically quiet or noisy environments and with simpler antennas that did not need the 2" air gap (Figure 3). The ACN could also operate larger antennas. However, there was minimum improvement in operation in a saline environment. Furthermore, the system design had each ACN being maintained in a standby mode when it was inactive; calculations indicated this would result in a system that required more power than the FS1001M to operate six antennas instead of the desired lower power consumption.

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In September 2009, NOAA Fisheries received a prototype system with one MC and two updated ACNs (Figure 4). At this point, the MC firmware only has limited diagnostic capabilities. We are still evaluating the prototype system and are expecting an update to the software by the end of October that will hopefully fix some of the deficiencies we have already identified. During our initial evaluation, we again found that tag detection was better than the FS1001M, but only one antenna worked when two antennas were placed within a few feet of each other. This compares unfavorably to the FS1001M or Allflex units where antennas work when installed touching each other. We also identified that the Controller Area Network (CAN) protocol, which requires a terminating resistor, could potentially lead to all of the antennas becoming inactive if the resistor was in the last antenna and it was lost during inclement weather.

Figure 3. Photos showing the first ACN prototype and the evaluation of a 4' by 4' antenna without an air gap in Lake Washington.

Destron is investigating alternative locations for the terminating resistor to avoid this scenario and determining how to make adjacent antennas function. In addition, since the ACN does not appear to be a low-cost unit, we have requested that Destron Fearing determine what would be necessary to make it possible to extend the cable length between the ACN and its antenna from 50 to 100 feet (preferably longer) and still perform well. We want to emphasize that we are expecting improvements with the new software. Furthermore, we want the fisheries community to know that we are working with Destron Fearing, PSMFC, and Biomark to ensure that the finished transceiver performs well for instream applications. We think that the finished product will be available in 9-12 months.

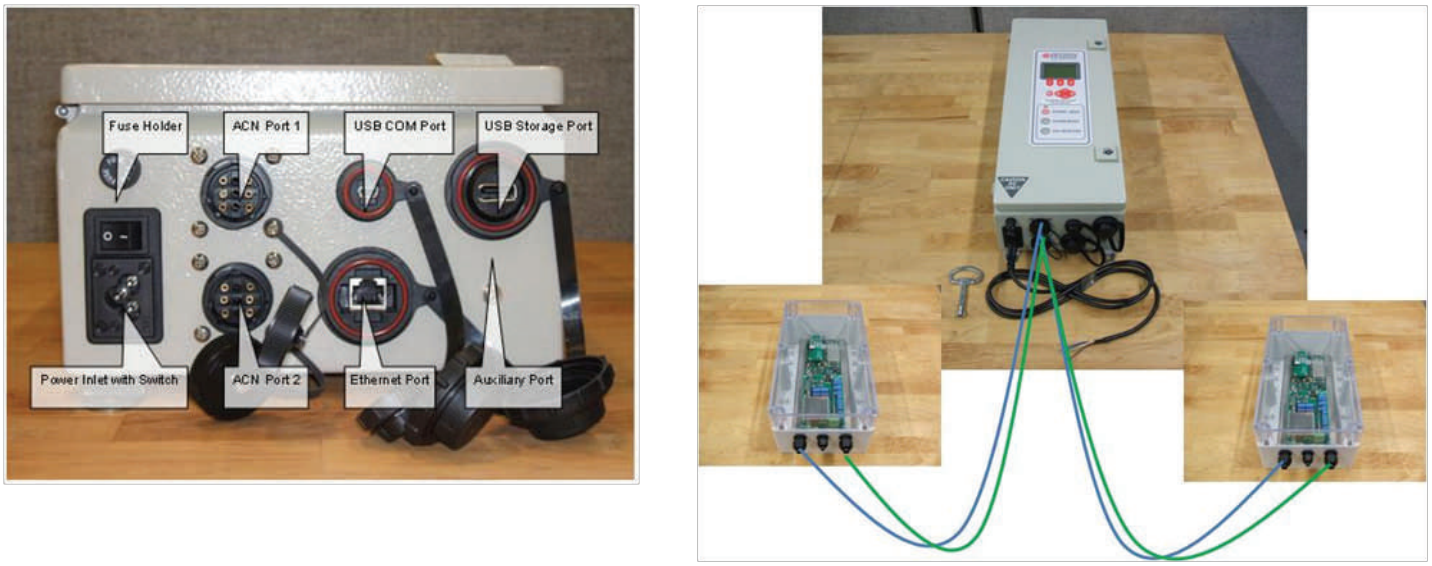


Figure 4. Photos of the prototype PIT tag system with one MC and two updated ACNs. We drew lines to represent the antenna cables and communication lines that connect the two parts. Each ACN would also need power to energize its antenna.

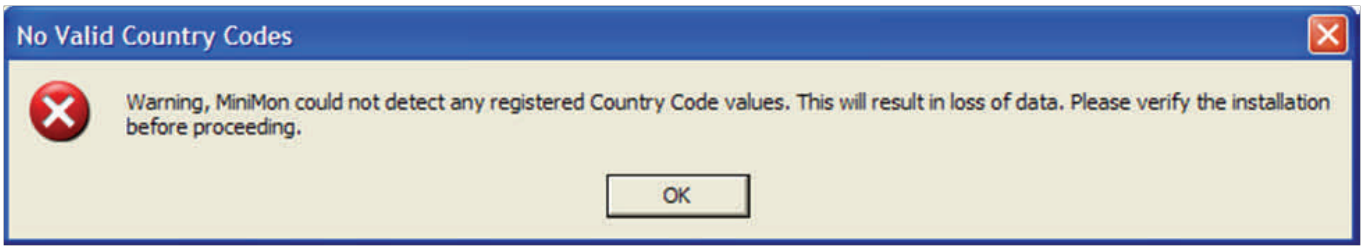
Running MiniMon from Accounts Without Administrator Privileges

JOHN TENNEY (PTAGIS Portland Office)

MiniMon is PC-based interrogation software developed by PTAGIS in 1999. This software was designed to run unattended on a dedicated system and to be installed in a user account with administrative privileges. In the last 10 years, security and administrative polices have restricted user account privileges on enterprise and office-based systems. This article provides workarounds for some scenarios encountered by end users due to administrative installs or limited account privileges.

Updating MiniMon Installation

In this scenario, a system administrator installs MiniMon with a local administer account and expects the software to be run from a different user account. During the MiniMon installation, the system registry of the current user account is updated with a list of well-known ISO PIT tag manufacturer codes. When the user runs MiniMon from a different account than what it was installed, the following error is generated:

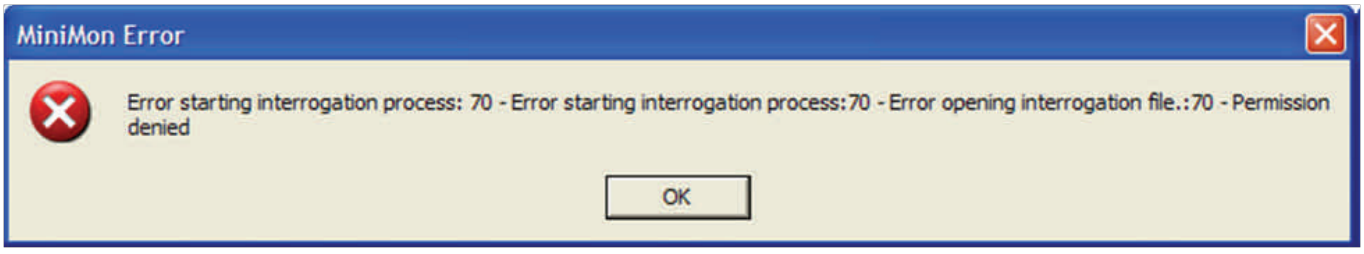


To resolve this issue:

1. Close the MiniMon application.
2. Download the file ftp://ftp.ptagis.org/Software/MiniMon/Misc/MiniMonCountryCodes.zip and expand to a temporary directory.
3. Open Windows File Explorer utility and navigate to the temporary directory you saved the file to.
4. Dbl-Click the file to execute and say 'Yes' to the confirmation prompt to allow the country codes contained within this file to update to your MiniMon registry settings.
5. Run MiniMon again and the "No Valid Country Codes" error should not display.

Configuring MiniMon Output Folders

MiniMon creates folders in the installation directory (default is C:\program files\PTAGIS\MiniMon) to store data and logging files and requires read/write access to create files in these folders. Some system administration policies require program installation folders to be read-only. This will cause the following error in MiniMon when starting the interrogation process:



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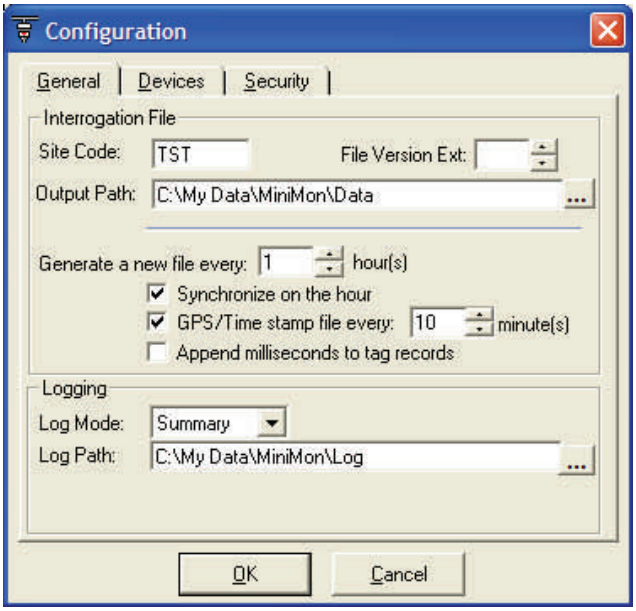
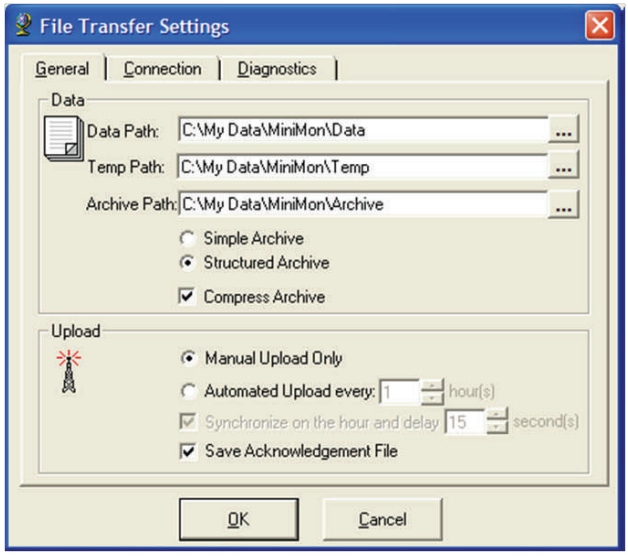
To resolve this issue:

1. Open the MiniMon application.
2. Redirect the output folders for **Output Path:** and **Log Path:** values displayed in the **General** tab in the **Configuration** settings to alternate folders that have read/write privileges for your user account. For example:



3. Click OK and save the settings.
4. Similarly, change the output folders in the **File Transfer Settings** to folders in the same relative location:



5. Press OK to save these settings.
6. Run MiniMon and press the **Start** button to initiate monitoring and the *70 –Permission Denied runtime error* should not appear.

We will ensure that all next-generation PTAGIS client applications comply with the latest security and administrative practices. However, in some cases M4 may still require elevated privileges to access system resources while performing data acquisition.

Low Frequency Noise Interference on Instream PIT Tag Installations

GABRIEL BROOKS, BRUCE JONASSON, AND SANDRA L. DOWNING (NOAA Fisheries)

The number of instream PIT tag transceiver installations has grown rapidly and the antenna sizes have increased since the initial installations in 2001. With nearly all installations, a thorough examination of ambient radio frequency (RF) noise is a prerequisite for determining site suitability. Once installed many sites are impacted by sources of electromagnetic interference (EMI) from both local indirect emitters (e.g., AC to DC converters, laptop or battery chargers) and site-specific emitters (e.g., nearby variable frequency drive motors, reciprocating generators and grid power). Determining the source(s) of noise can be difficult and often requires a great deal of troubleshooting.

During the spring of 2007, an intermittent catastrophic level of EMI (Electromagnetic Interference) was detected at an instream site on the Cedar River near Maple Valley, WA. This site is part of a NOAA Fisheries, Seattle Public Utilities and University of Washington collaborative study. It consists of six large (20' by 4') unshielded antennas (Figure 1), a Global Thermoelectric propane generator (TEG), and a Destron Fearing FS1001M. Status reports from the FS1001M transceiver reflected periods of low noise (0% - 14%) (Figure 2) with occasional spikes to 93% (Figure 3). This maximum noise reading would last from several minutes to several weeks.

Typically when high levels of EMI are recorded, it can be traced back to a single noisy component; however in this case, we were unable to determine a local source. We then examined the status reports from multiple sites located around western Washington and were able to determine that the source of the low frequency (LF) noise was not localized at or near the Cedar River site, but impacting all of our sites in western Washington. In July, we conducted several tests throughout western Washington to determine the location of the LF noise generator. With the use of a spectrum analyzer, it became apparent that the noise was a directional (north-south) ground wave which was quickly attenuated by the foothills of the Cascade Mountain range. We then contacted the Federal Communications Commission (FCC) to assist in the identification of the transmitter. With the help of the FCC and their counterparts at Industry Canada, it was determined that the transmitter was located near Vancouver, B.C. and licensed to operate within the ISO 11785 (Radio Frequency Identification of Animals) band with a maximum output power level of 50kW.

When NMFS contacted the operators of the transmitter we were informed that the tower would be down for maintenance and replacement of several failed components. Noise levels at our sites including the Cedar River site remained low for twelve months following repairs. Then on 20 September 2008, the catastrophic noise returned. We contacted the operators and were informed that the system had been inactive for this time, but was now active. We were also informed that the system would become more active in late 2009. NMFS requested that a controlled test be conducted in order to determine the impact of the signal at varying output power levels. This test was conducted on 7 May 2009. Noise levels were recorded in detail in order to determine the feasibility of designing a filter to eliminate its impact. During this test, it was determined that the scope of this noise included sites at least as far south as the Columbia River.

NMFS is currently working with the ISO board to determine if an option exists for changing the Vancouver transmitter frequency. In the interim, a contract was issued to Destron Fearing for the development of a filter to block the in-band LF noise.

NMFS received the prototype filter from Destron Fearing on 13 October. Initial results from a laboratory test with a frequency generator showed that the filter blocked the simulated noise with minimal reduction in read range. On 15 October, the prototype filter was installed and tested at the Cedar River site with a frequency generator. A follow-up control test has been scheduled with the transmit station for 5 November 2009 at 1200 PST.

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Our hope is that the results from the transmission test will conclude that the Destron Fearing filter will remove most, if not all, of the LF interference without sacrificing overall read range. During the test, we will take read range measurements and record the noise levels within the transceiver and finalize adjustments on the filter.

Figure 1. The six unshielded antennas at the Cedar River.

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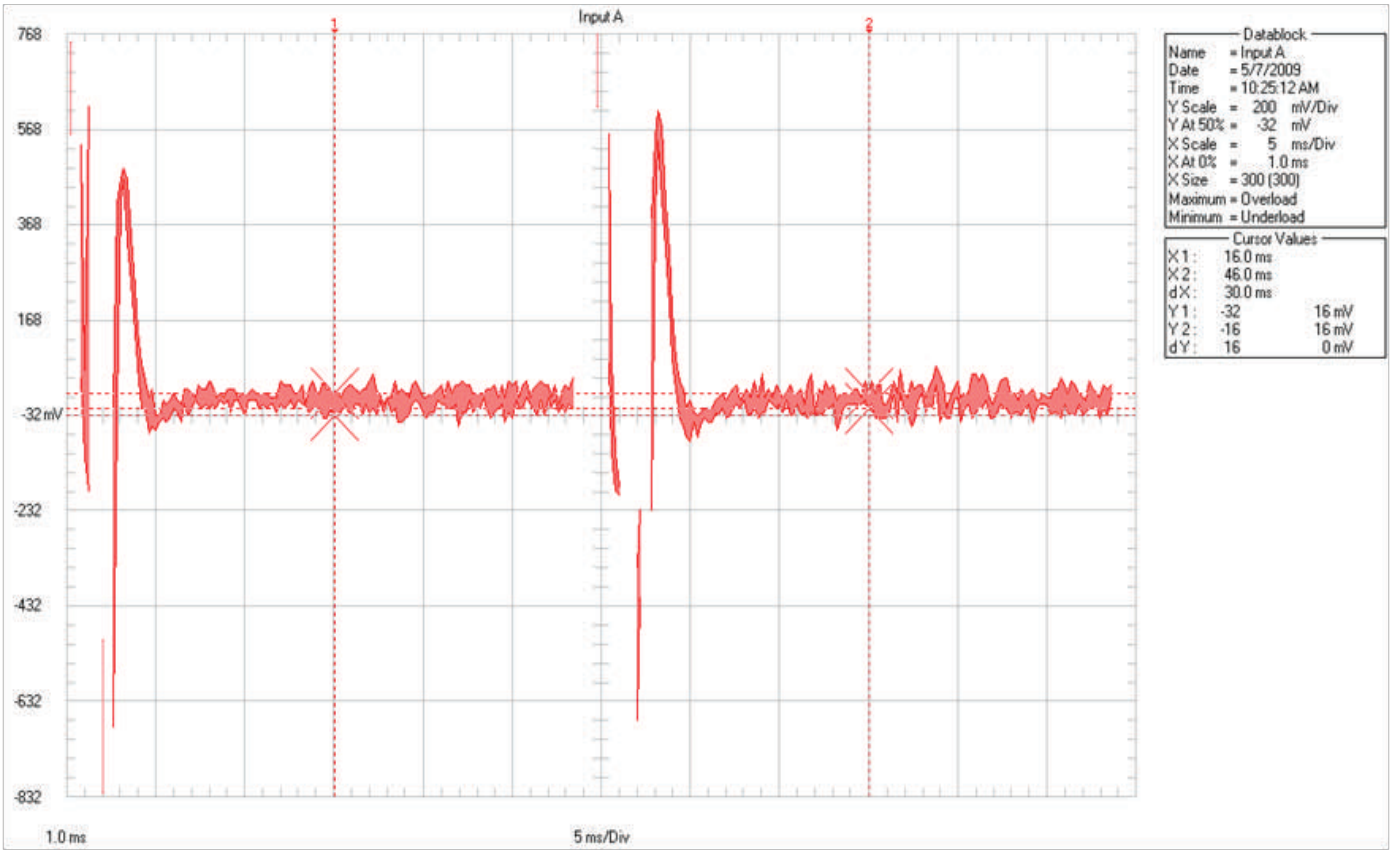

Figure 2. Antenna noise without LF interference.

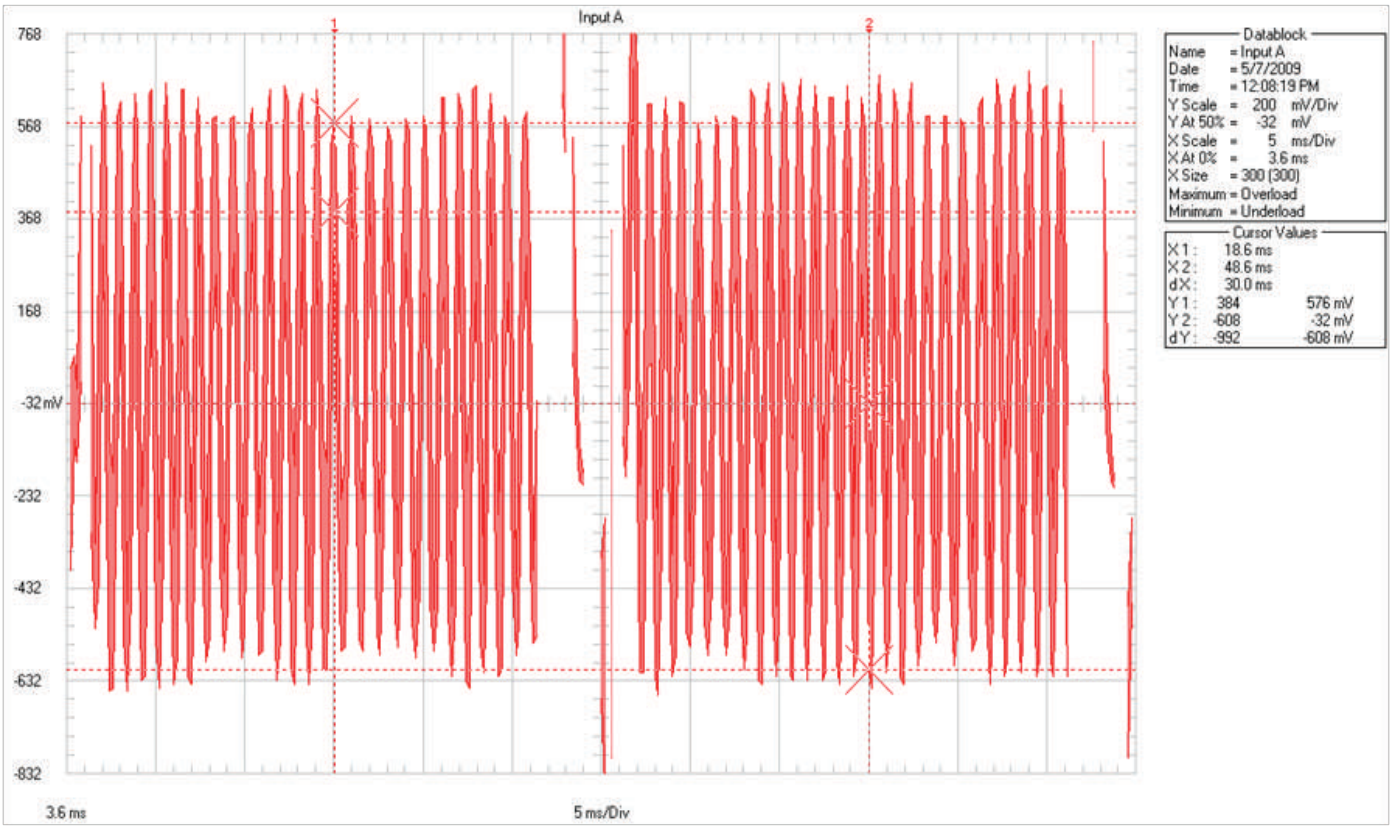

Figure 3. Antenna noise during LF transmitter operation.