ORDA Installation Notes & Lessons Learned

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Introduction – The WFO Lubbock has been one of the first sites to complete the installation of the ORDA as deployed after the beta testing sites. There has also been a lot of preliminary information and formal pre-installation check-off documents sent out prior to the installation that will be sent to you as your scheduled installation approaches. It is my opinion however, that much of this preliminary information is still rather high level. I felt there was a gap in that there is a real need for installation notes and lessons learned from the standpoint of the station electronics technician. As I have just completed my installation, I have noted numerous items I felt worth passing on that would be of great importance in order to avoid common or repeated mistakes. I admit that there were some problems that manifested during my installation, and wish to pass on important notes that I took throughout the entire installation process.

I wrote this document with the though of conveying installation notes and lessons learned to the field offices. Although there is useful information for MICs, and ESAs, this is installation notes, tips, and lesson learned from one site electronics technician to another. I am writing this as an informal compilation of my notes, sprinkled with a bit of my humor. Although this is perhaps a somewhat lengthy document, I feel it is well worth the time to review what I have learned through my installation so that your site transitions through this installation more easily. If you already have a real good grasp on what to expect for your site installation, you might wish to just scan through some areas of interest. However, if you are already hiding under your desk with butterflies in your stomach as your installation date approaches, this document may really help you out.

Pre-installation Preparation – From my conversations with the contractor lead engineer, ROC Hotline, and INCO Team, and their awareness of my intent to draft this paper, the aggregate opinion is that much of the problems associated, and expected from the ORDA installation process stem from oversights in the site pre-installation preparation. You will receive a checklist a little more than one month prior to your site's scheduled installation. However, as mentioned earlier, I feel this is somewhat of a high-level checklist and doesn't mention numerous low-level preparations that are nonetheless critical to avoiding delays, problems developed during the installation process, or "show stoppers" that may require rescheduling your installation shortly upon arrival of the team. Many of these pre-installation notes are comments from the installation team members who have already performed the beta installations, and their concerns as they begin their travel from site to site, noting variations and differences.

RDA Shelter Preparation – Perhaps one of the prominent comments from the installation team was their appreciation of the cleanliness of the RDA shelter. Having it as uncluttered, and making as much room as possible really helped as there is a tremendous amount of equipment, supplies and tools brought inside the shelter. I am perhaps a bit fortunate as my shelter is somewhat longer than most (which might have been designed for the co-located RPG). I transferred as much unnecessary equipment as possible to the TPS shelter in order to make room for the team member (and myself), along with all their equipment.

I also noted that there really wasn't enough workbench space in my shelter. Although I cleaned off my workbench completely to accommodate their several notebooks, manuals and tools, we quickly ran out of space and found ourselves piling up items on any horizontal surface available. I was just about to run out and bring back a small, folding card table to help with this problem. You might consider that idea and keep it folded up to the side someplace should this situation occur with your installation (which is highly likely).

Although I had ensured my shelter floor was clean (and the team openly thanked me for that), I admit that I had somewhat neglected to really wipe down the tops of the UD4 and UD5 cabinets. Lubbock is in West Texas and we are really vulnerable to very heavy dust. As the installation included extensive work and re-cabling upon the tops of these cabinets, the dust problem really created problems not only with the obvious personal inconvenience, but also with drilling and punching new holes and cut-outs in the tops of these cabinets. I admit that this proved to be a bit embarrassing to me as that was one of the areas I did not put enough time into during my cleaning the shelter. The team members also had to spend a lot of time lying on the floor in order to remove and make modifications to the UD4 power supplies, so having a clean floor was also appreciated and commented. Think of how you would like to have a shelter floor if you were to lie on your back for a couple of hours – it is good courtesy to the installation team. Additionally, I found it was really beneficial to have a couple of stools inside the shelter. I think I got them on sale at Wal-Mart for $9.95 a piece. Everyone will make good use of stools and chairs as you pour over manuals, schematics, etc.

As part of your preliminary work, pay close attention to your installation of the RDA Cooling Efficiency System (dated back in November 20, 2000 – and if you haven't installed it – shame on you!). The ducting runs directly under FL3 (1FL3), which is mounted on the ceiling directly over the UD5 cabinet. If there is less than 4-inches clearance to access the filter (and this is the very minimum), you will need to call a local air conditioning contractor to temporarily remove this ducting in order for the ORDA Installation Team to perform necessary work on the filter. ****NOTE: This can be a potential show stopper if this requirement is not met!** You will not find any mention of this within the pre-installation check-off list. As part of your installation, the team will have to gain access to the plate on the bottom of this filter in addition to removing a cable. The team had commented that the ducting positioning at each site is radically different. I feel this is due to the fact that most were fabricated and installed locally to each site.

During the pre-installation check-off list, pay close attention to the positioning of your DAU panel! If yours is too low, you must relocate it in order meet the required clearance specification! I took the time to actually measure my DAU (UD5A3) and found that it did not meet the clearance requirements and I had to relocate it up higher in the rack. I might want to emphasize that you are expected to do this, not the installation team. If the team arrives and finds this was not done, they are probably going to hold up and ask you to correct this, and that creates a delay in an already very tight schedule.

Another often overlooked part of your preliminary preparation; make sure your fluorescent lights are all working as the team will need *plenty* of light. I have heard stories from the team of other sites with only partial lighting working and it made their work extremely difficult and sets the stage for installation mistakes (and there is a lot of areas to make a cabling mistake). This

situation would require extensive use of portable lighting. I cannot emphasize this enough as the potential for cabling mistakes is very great considering the magnitude of this radical configuration change. As I will describe shortly, we did encounter some cabling mistakes that we discovered through startup errors. Having poor lighting will only exasperate this potential problem. Although I am beating a dead horse (and will continue to do so throughout this paper), these problems are not accounted for during the aggressive installation schedule, and will cause delays that must be made-up in longer working hours and overtime. If this is serious enough, you might find the team insisting on your rectifying this prior to their commencing work. I am of the opinion that much of the fluorescent lighting problems stem from the installation of the RDA Cooling Efficiency System. Some installations might prevent accessing the fixtures for lamp replacement, and/or some fixture might have been removed instead of relocated (I choose to relocate mine). In any case, you will have to find a way to correct this if you have this problem at your site.

As part of your preliminary work, I would also recommend backing up your adaptation data to tape and send to the ROC for a requested printout (and hopefully have this available before your scheduled installation). I understand the juggling act in that you need to allocate the turn-around time on this, and at the same time, have a good calibration close enough to your scheduled installation date. However, you will find there will be a real need to have a printed, complete adaptation data as this becomes important during the critical calibration phase of your installation. This will ultimately become a real time-saver. I feel that we might have saved a significant amount of time would I have done this at my site. In a pinch, you can take your last printed adaptation data and make pen changes. You should make it available to the INCO team.

Calibration – Perhaps the most important aspect of your pre-installation preparation will be the system calibration. The ORDA system pre-check list you will receive lists the following:

- Run test attenuator calibration;
- Receiver/Signal Processor calibration; and
- Perform receiver diagnostics

Folk, this is really the bare minimum, and in my opinion, insufficient. The best bottom-line advice I can offer is to perform a complete and extensive calibration of your entire RDA. I know that is a lot, and goes much further than the ORDA system pre-checklist, but it will prove to be time well spent. The bottom line is: make *sure* calibration is good and RDASOT passes all receiver subtests. Additionally, it is not sufficient to just have your entire set of receiver subtests pass (that is, adhering to the "pass/fail" criteria). When performing the receiver subtest, take the time to look at the measured and expected values along with the deltas. I discussed this with the contractor lead engineer, and it would be to your advantage if the deltas were less than .5db on these subtests. Although all of my receiver subtests passed, I admit that my subtest 9 had a delta of close to 1.5db (I think the criteria was 3 db). Even though this technically "passed" the test, this pointed to the need to re-measure the losses in my 4A24 2-position diode switch. I will once again beat the drum that this is yet another delay.

One of the comments from the team was the apparent common encountered problem of high receiver noise temperature. You should have your receiver noise temperature below 500. As an example; I had a short pulse noise temp of 447, and my long pulse noise temp was 411 before the

start of the installation. However, I too had a developing problem with high noise temperature as I was preparing for the ORDA. My receiver temp grew to 584K. It seemed that as I was troubleshooting, it kept growing. I had to send in my pre-checklist with that figure with an annotation of my still working on this problem. As expected, I received some critical email about this. I was able to finally resolve the problem and bring my noise temps back down to 447 for short pulse and 411 in long pulse. I then sent out an update to my pre-checklist to reflect this. Although I did initially receive some criticism for the initial problem, I was later thanked for my honesty in reporting my situation accurately and taking the corrective measures necessary to resolve the issue. I later learned that there is a real problem with many stations with high noise temps, some as high as 700K. Although many times it is pretty easy and straight-forward to use the R-12 procedure to locate the problem, it is also common that these noise sources are difficult to pin down. I had two bad cables in the swing out door that really threw me for a loop, and I spent a lot of time working this problem until I finally pinned it down. As a quick tip: when measuring the noise floor with the progressive termination (using the R-12 procedure), wiggle the cables associated with the measured module or unit and see of your power meter reading jumps. If it does, you found a bad cable (and this is common in the swing-out door assembly). Ironically, I spent a lot of time troubleshooting and working on the swing-out door assembly when I knew it was going to be completely removed and discarded with the ORDA installation. Some of you might be thinking the same thing, and asking yourselves "why bother putting in the time on this when it is going to be replaced anyway?" You will only be short-changing yourself and your field office if you do not resolve any noise problems and complete a good calibration.

You need to make sure that there are no surprises to the team when they arrive. If you have some illusion that the ORDA team will troubleshoot your noise temp problem (or any other problem for that matter), you are in for a big surprise. The ORDA team members are not WSR-88D Electronics Technicians. If there is a problem that will preclude the installation process due to something outside the required parameters, they are going to hand you the power meter head and screwdriver and ask you to fix it on the spot. If the problem is serious enough to delay the installation for several hours, you will genuinely risk potentially rescheduling your ORDA installation until after the other scheduled sites are completed. It will be a really dark day in your career if you have to go before your MIC and explain this due to your error. You have been warned!

If you are weak in some technical areas of troubleshooting or calibration, I have some advice to prevent a catastrophe. As soon as you finish reading this paragraph; call the ROC hotline and ask to speak to a Catholic Priest Electronics Technician, and spill your guts and confess all of your radar sins. They will most likely tell you "shame on you" but will genuinely appreciate your honesty and can head-off a potential (and embarrassing) reschedule. The ROC personnel are aware that there are problems out in the field that can really impact the aggressive ORDA schedule. They can send someone out to help you with your radar and get problems resolved prior to your installation. This is a much better alternative to hiding under your desk.

Technical Manuals & Laminated Flow Diagrams – I intentionally put this section here as I felt it is really important to have the manuals prior to the installation. I found that we needed the manuals immediately for some of the problems that manifested during the installation, procedures for performing some system admin, and other technical information. You might find

a minor screw-up in the "as received" EHB 6-515 in that the first 5 chapters are within a package falsely labeled as "XEHB-6-526." Once you open this package and remove the cover sheet, you will see that in reality, it is the first 5 chapters of XEHB-6-515! Hopefully this has been corrected before this document is distributed. This initially caught me off guard and I thought I had received only a part of my full manual. I wasted some time calling around and jumping up & down over this perceived error, when in fact, I had the full technical manual. Although it is somewhat embarrassing on my part, I took the plastic-wrapped packages with the cover sheet for face value and thought I had a problem (please learn from my mistake). Hey, how was I to know the EHB-6-515 was hiding under the 6-226 cover sheet??

The other important issue, and one that is still unresolved as of this writing (12/03/05), is the lack of the large flow diagrams that most of us laminate and hang up on a wall inside the RDA shelter for troubleshooting. I realize that every electronics technician has his/her way of working and troubleshooting their radar, but I feel I absolutely have to have these flow diagrams to follow along and reference as I work. I feel they are essential. The contractor engineer who was on site gave me his 22" x 18" copy before he left (and I am very grateful for his kindness to do that), so that I would have something to work with. He was there and overheard me while I was on the phone begging and groveling to get these laminated flow diagrams Fed-Ex shipped to me (and to no avail). My best advice is to not wait and see if you get these flow diagrams, but start the "beg and grovel" process now as I feel you cannot do much until you have these on hand. Look at it from this point of view: when the team finishes up and Friday and departs – it is *your* system, and you will be expected to work on it!

Software Note 79 – You should have Part-1 of this installation completed and tested via the loop-back plug sent as part of the Modification Note package sent to you. I am going to go out on a limb and make a profound and controversial statement: John Hickman (me) says the loop-back plug sent to you is *not* a RJ-45 wrap plug as labeled. I say the look-back plug is actually a RJ-48 wrap plug. I will undoubtedly receive some hate mail from this statement, but I am sticking to my guns and arguing this point for a very important reason. A "standard" RJ-45 wrap plug as used on Ethernet uses pins 1, 2, 3, and 6. This works on numerous networking devices *within a LAN*. The wrap plug sent with your Modification Note uses pins 1, 2, 4, and 5. This is the wiring standard used for the TELCO side of the CSU, which is RJ-48. I am going to all this trouble of emphasizing this as I feel just about every electronics technician out in the field has a RJ-45 loop-back wrap plug in their drawer of goodies, and it would be easy to mistakenly think these wrap plugs are the same. I can just see someone just grabbing his own RJ-45 wrap plug out of his/her drawer and using this to make the test – in which case, it will fail! I wouldn't want anyone to needlessly waste a lot of time troubleshooting a problem that doesn't exist because the package label is misleading. If you don't believe me, look at the wiring on the wrap plug supplied with the Modification Note, and a standard RJ-45 Ethernet wrap plug.

Side Note: You might recall that this loop-back is performed at the TELCO side of the Verilink-2100 CSU connected to the router. This checks your WAN connection to the TELCO side. If you have a wideband outage and you are able to perform this test successfully at your RPG, and you are able to loop-back at the RDA site of the connection, I think you can pretty much be sure that your local TELCO has the problem. Hmm…perhaps this might be a good troubleshooting aid. You might want to hold on to that RJ-48 wrap plug and store it someplace safe.

Arrival of the Team – My ORDA installation started on a Monday, but it was pointed out in both the pre-checklist and the pre-planning conference call that the INCO team will arrive the Sunday before. This is not something I would take lightly, as it is an excellent opportunity to start things off on the right foot. I was waiting at work for the team to arrive and call me. I met the team, introduced myself and gave them a tour of both the office, and took them to the RDA for a site inspection. This accomplishes a lot. The team really needs to see your site installation the day before so as to assess their work. Some of the important aspects of touring the day before includes:

- Let them assess your installation and how your radar is currently running (sys-cal, parameters, etc).
- Give them information of facilities nearby and how far (such as restroom, convenience stores, restaurants, etc).
- Afford them the opportunity to drop off their tools and equipment, plug in and charge their cordless drills overnight (this is really important to them).
- Give them important contact information (including yours).
- Agree on a time to start in the morning (you will want to start as early as possible).
- Discuss any site access issues if necessary (I even gave them a spare set of keys).
- Discuss with them your role and participation (are you going to be responsible and stay with them through the installation or go hide under your desk?).

If the team notes any real problems during this pre-installation Sunday tour, they can bring it to your attention and give you time to correct these oversights on the spot. Obviously, you should be prepared to work that day if necessary. It is my sincere belief that any problems brought to your attention that Sunday should be corrected then, and to the best of your ability before the next morning when thing really get busy and hectic. With the aggressive schedule of these INCO teams, there is really no room for delays. The initial time you take to welcome these INCO members and show them around on the Sunday before really is time well spent. They will sleep better that night knowing exactly what your site is like, and how to initially plan their first day.

Working with the Team – I will have to say that your role as the site electronics technician is two-fold. First and foremost, you are there to be a witness and observe the installation process from beginning to end (that is, if you are smart, you will do this). Just as important, you need to be right there on-the-spot to answer the many questions that will arise in addition to correcting any problems (and there will be some – you can pretty much bet on that).

As an observer, it is unproductive and somewhat rude to stand over their shoulders or hover over them like the Angel of Death. The INCO members are competent in their work and are genuinely a great bunch of guys. Afford them the respect they deserve, but use some tack in keeping track of how things are going. They will definitely want to talk with you a lot throughout the installation. I tried to be as helpful as possible and made every attempt to answer any and all questions they had. I enjoyed a great working relation with them and it genuinely was a pleasure to work with them. A benefit of being on site throughout the entire installation process and witnessing the progress: I got to learn a lot about all the cabling of my (new) radar system. I don't have to make a long dissertation about the importance of this.

The equally important requirement of my presence was when a problem manifested itself. If something happens where a problem precludes the INCO team from continuing until it is resolved, you (the electronics technician) need to be right there to take over as the installation now shifts to troubleshooting mode until the problem is corrected. I will re-iterate: *the INCO team will not be expected to troubleshoot your radar problems*. If you off doing something else (like hiding under your desk), the team has to stop where they are until someone arrives, troubleshoots, and corrects the problem. Only then can their work continue. I cannot emphasize this enough. I hope you can see the significance of performing as much preparation as possible to minimize this as much as possible. Additionally, I hope you can see that this can really jeopardize the time line of the installation and require overtime to make up for these delays. In a real worst case scenario, you might get rescheduled!

When Problems Occur – I felt this is the appropriate place to address this. It is unreasonable to expect no problems during this process. When problems occur, it is important to do two things: do not panic, and work to resolve the problem as quickly as possible in order to minimize the delay and overtime. Before delving off on this, I wish to address the common human characteristic of pointing the finger in blame for problems. There are probably going to be problems stemming from both mistakes made in the installation (such as wiring or cabling), and problems that manifested due to some oversight on your part. I am not the one to say "this problem is my fault, and that problem is your fault." As an observer and witness, I feel I am *overall responsible* for verifying all tasks completed properly on the INCO check list. Therefore I feel that I must accept the overall responsibility for any problems that arise as it is *my* radar site. Sure, there is a great potential for mistakes on everyone's part as this ORDA installation is a huge and complex undertaking. The point is not to worry about blame, but work to resolve these problems as everyone shares the common goal of completing this on time.

I would have to say that my most stressful moments were when problems occurred. As I said before, when problems manifest that point to legacy radar problems, and possible errors unforeseen, you are expected to troubleshoot! You know your radar better than the INCO team. Although they will most likely offer any assistance to you that they can, you will most likely have to lead the troubleshooting efforts stemming from these problems. The initial advice I gave to "don't panic" really should be kept in the forefront of your mind as many of these can stem from minor errors that appear to be much greater than they really are. I would like to share with you (openly admit) some of the problems I encountered during my installation process, and the compounded problems of delaying the installation process until they were resolved.

During the calibration phase of the ORDA installation, which we started on Thursday morning, the INCO team had a measured parameter which was outside the specified limits accepted by the program. Upon reviewing the flow diagram I had taped up on the transmitter cabinet, we felt that we needed the check the path to the 4A29 RF Log Amp Detector back through the 2-position diode switch 4A24, 7-bit RF Test Attenuator 4A23, 4-position Diode Switch 4A22, and back to the RF Generator 4A1. We made extensive measurements and obtained bewildering results that ultimately lead us to believe that my 4-position diode switch 4A23 had suddenly failed during this process. We halted the calibration process and spent hours troubleshooting this problem. We checked and double-checked our findings. We verified the control cable was connected to the 4A22, and that all RF cable connections were tight. We also measured cable losses. After hours

of troubleshooting this bizarre problem, we finally noticed that the control cable coming out of the top of the cabinet was not making a complete connection and only part of the pins were making contact. When we reconnected and tightened this connector, the problem magically went away. However, we did spend several precious hours as we sent ourselves on a wild-goose chase that we later had to pay for in additional time that evening working in order to make up for that loss in calibration time. As I wish to reiterate, I feel that I have to accept overall responsibility as the witness and not point fingers at anyone.

Another delay was later that evening when we went to view the RF transmitted pulse for setting up the RF bracketing. When we first looked at the pulse, I about went into cardiac-arrest as my presentation on the oscilloscope was absolutely horrible. The team essentially looked at me, handed me a screwdriver and said "adjust your transmitter." There appeared to be no way to continue until the transmitted pulse was corrected. I started with a transmitted pulse that was strictly "el-stinko" and spent a lot of time adjusting the klystron cavities until it was only horrible. In short; and after wasting a lot of precious time getting "wrapped around the axle" sort of speak, we found that the oscilloscope was mistakenly set on 1MΩ impedance instead of the required 50Ω as prescribed in the procedure. After the oscilloscope was terminated in the proper impedance, the waveform appeared correctly (and pretty good I might add). I made some adjustments to bring the waveform into optimum square-wave. Coincidentally enough, the final settings of the six klystron cavities were almost identical to what I initially had. Again, and the point I am trying to make with this long dissertation; we wasted a lot of time chasing our tails due to operator error, or more commonly called "cockpit errors."

Another error in our APC UPS cabling indicated no loading on our UPS system as indicated by the lack of LED illumination. Again, we wasted some time pinning this down as well. The last, and perhaps most time consuming problem was the discovery that my elevation drive motor was going bad as indicated by our inability to accurately tune the DCU in the elevation. This bewildered me as I had just recently replaced that motor, and we were getting indications that the tachometer feedback was erratic and running too high (yes, I wrote that correct). I had just recently aligned the DCU with no apparent problems. We burned up a lot of precious time with the DCU, cleaning slip rings, replacing all the signal contactors on the slip rings (I felt they really needed replacing anyway), and finally the motor itself. I am mentioning this as I had no real problems running with the legacy, but with the ORDA installation and its tighter tolerances, it would not run and continually give up Forced INOP elevation alarms. We worked on that problem until 1:30 am Friday morning. I went home, got a few hours of sleep and I was back at work at 6:30 that morning.

Once again, the point of listing all these problems is not to convey all our screw-ups as much as I want to paint a clearer picture of the common problems you might expect, and some idea of the problems you might not expect. More importantly, these problems halt the ORDA process in order to shift into troubleshooting mode and burns up precious time that is not allocated for your installation timeline. Please be prepared for this. You can minimize this be being on site during this entire process so as to not force the INCO to wait around for you to show up when they call you (should you have elected not to be there). In short; you are offered the elective to either stay on site with the INCO team or hand them the keys and let them work while you are absent. I feel if you are smart, you will be on site and ready to jump in when a problem arises.

Day by Day Installation Breakdown – Although there is some information describing this contained within the pre-checklist that you will receive about a month prior to your scheduled installation, I view this as a generalized overview and somewhat vague from the standpoint of where you, the electronics technician, will fit in. I will therefore describe the process from my standpoint. Perhaps you might use this to assess how you might to want to participate in your installation. I also included some suggested tips and notes for you to consider.

Sunday – This is the day prior to the installation. I had already obtained authorization to work this day in preparation for the installation the next day. I had plenty of prep work to do. Most importantly, I met the INCO team when the arrived in town and called me. I spent a good while driving them around, touring the station and RDA with them, and providing information about facilities and others necessary information. Offer them the opportunity to take a quick look at your radar and parameters, drop off their equipment, etc. Agree on a time to start in the morning, where to meet, RDA access, expected working hours, spare set of keys, etc.

Monday – Start as early as you can! You will be miles ahead if you get on site and give them the radar as soon as possible. We started at 7 am every morning, and worked a *minimum* of 10 hours every day. The INCO team would prefer to have the in-briefing at the RDA with site personnel. This may include the MIC and ESA, and any others interested. In my case, it was just me (and that is fine as long as that is acceptable to your office). It is important to give them control of the radar as soon as possible. I have noted from conversation with the INCO team that if they cannot have access to the RDA by noon, they are to call their upper echelon and you risk a reschedule!

The first thing they are going to do is write down your parameters and verify your calibration. They will certainly look at the deltas of your measured and expected values of your paths in addition to your receiver noise temp and SYS-CAL. If you did something shameful such as fudge your numbers or "accidentally transpose" numbers for your noise temp, you are now going to regret doing that. My numbers looked very good and they were very pleased with the initial condition and calibration of my radar. They also re-ran Sun-check. They re-ran RDASOT and performed all receiver subtests. We noted that although all passed, the lead Engineer did catch a delta of almost 1.5 db on Subtest-9. We later corrected this with a measurement of my 2-position diode switch and corrected the adaptation data. Speaking of adaptation data; they will write down a lot of adaptation data parameters prior to beginning. All this will be your baseline checks.

While we did this, the other INCO team member inventoried the equipment shipped to me. There will be 7 boxes shipped to your office. I stored them at the site in the TPS shelter for easy access, yet allowing room inside the RDA shelter for working.

Next was the rip-out phase where you will be appalled at how much of your UD4 & 5 cabinets will be stripped and piled up outside the door of your shelter like a pile of garbage. Before delving into this; it is highly recommended that you turn off the transmitter high voltage, but keep the AUX power on. There are a few things that will be kept, and you must ensure that these are not damaged as the parts appear to be thrown on top of each other. You will probably have to Fed-Ex overnight your old 4/104W413 cable, as it will need to be quickly rebuilt and sent back out for another installation. They also wanted to keep my old W205 and W206 cables (these are

the small SMA cables between the 4A7 & 4A8; and between the 4A8 & 4A9 modules respectively). When you are piling up your old legacy part to be hauled off, it would be a good idea to rescue the 10-position switch from the swing-out door to keep as a spare (remember you still have one on the receiver panel). During the initial installations, the INCO teams will collect about a dozen 4A11 A/D converters. Believe it or not, the 4A8 and 4A9 are not on the list to save. But call up the ROC and see if they want them or any other parts from your legacy junk pile. There maybe a dozen or so station electronics technicians fighting high noise temp problems in preparation for their upcoming ORDA installation. They ROC may need your good legacy parts to help and support your fellow electronics technicians. This is also a good time to partially repay the many helpful favors the ROC has bestowed to you over the years. If they need some of your parts, please be kind and ship them. I gave them my 4A8 and 4A9.

Tuesday – Still continuing with the rip-out phase and making preparations for installing new cabling and equipment. This includes a lot of drilling and using a knock-out tool, especially in the top of the UD4 & 5 cabinets. This is where I was slightly embarrassed over the dust on the top of the cabinets. I found this was an excellent opportunity for me to strip down the old swing-out door, collect all the parts and transport them to the office where we had the 2 pallets setup for piling up. Use the large boxes that contained the new parts! Put the large boxes on the pallets and carefully stack your old part in them as efficiently as possible to get everything in. We had to setup our pallets at our office as the RDA site had gravel access which prevented the use of a pallet jack. Your pre-checklist will mention this requirement.

During the later part of the day, the INCO team started installing the new cables and some of the equipment. I made sure I was there for this so I was able to get a good understanding of my cabling layout and equipment. This is a good time to really see and understand your ORDA installation from the ground-up. Later that evening, I completed the second part of Software Note 79, and made the loop-back test with the RJ-48 wrap plug. I feel it is best to accomplish this now as the pace will really pick up later, and the more important installation and calibration phase would require my presence continually at the RDA site (I wouldn't want to leave to finish up the Software Note during that time). I am of the opinion that you need to tie-up any loose ends you might have such as transporting the old legacy parts and Software Note 79 before Wednesday. After this day, you presence at the RDA might really be needed, so make effective and efficient use of your time now.

Wednesday – During the first half of the day, the INCO team will finish up the installation. I would take this opportunity to look over the cabling very carefully and thoroughly! Please be tactful and avoid getting in the way, but review the installation procedure often and double check the cabling. I found a cabling error on the 8-port "octopus" which I tactfully pointed out. However, I have to confess that there were others that we later discovered that we all missed. It really pays to be extremely thorough here during this critical phase.

Later that afternoon, we actually powered up the system and loaded the software to see where we stood. Your will probably feel a lot of anxiety during this time as you are not at all sure what you will find. My radar power up and, as I expected, we had lots of alarms and errors. It is also really important to have your wideband disconnected as you most certainly do not want to send any erroneous products to the RPG! We did however, make a connection to the RPG only

momentarily just to verify that they would connect and synch-up. You might keep in mind from the initial power-up, that you are still missing a lot of your adaptation data which you will later enter, nor is your system calibrated. So don't panic from what you initially see. However, if there are any other unexpected problems, you need to seriously look at them and plan what you intend to do about them. As I mentioned earlier, this is where I noted that we were now getting pedestal forced INOP errors stemming my elevation circuits. We didn't expect this and it forced me to jump into troubleshooting mode. We did some preliminary troubleshooting, but then continued on with other areas we could work on as part of prioritizing our work. We would later go back to that problem. At the end of that long day, we let the system run in standby mode so as to let things warm up and stabilize prior to the calibration phase which was to start early the next morning.

Thursday – This was "Black Thursday" for all of us. If there is any one day where I feel the site electronics technician needs to be on-site the entire day, this is it! As soon as we started the calibration process, we ran into problems. The application has built-in parameters as to what values are within acceptable range. The new R254 measurement was slightly higher than the allowable range. After careful and verified measurements, the lead contractor engineer determined that the 4A39 Burst Mixer was in fact, operating correctly. So he modified the scripted to accept the parameter and we pressed on. We then came to a screeching halt when we found indication that my 4-position diode switch was now bad. This was bewildering as it seemed to be operating perfectly with the legacy system – only now does it fail? Not likely. As I mentioned before, I had to shift into troubleshooting mode and make a lot of checks. In short, we wasted a lot of precious and valuable time chasing our tails. It wasn't until after lunch when the lead contractor engineer found the partial connection on the top of the cabinet for the 4A22 control cable (learn from our mistakes!). To avoid repeating a lot of information I have already covered, we really wasted a lot of time with cabling errors and test equipment setting errors. Add to this, we also had to resume troubleshooting the problem with the elevation drive circuit which was causing constant forced INOP errors. We felt that we absolutely had to resolve this problem now as it was critical to perform Sun-check tomorrow morning (Friday). In short, we worked straight through until 1:30 am Friday morning!

Friday – After about 3 hours of sleep, I arrived back at the RDA site at 6:30 that morning. We resolved the elevation problems and we were able to align the DCU with ease now. We ran Sun-check successfully and were pleased with the results. The remainder of that day was allocated to fine adjustments, and re-running tests. We finished cleaning up the site, and preparing the pallets of legacy parts for shipment. We reconnected the wide-band and synched-up with the RPG with no apparent problems. However, I later wished I had rebooted the RPG as I had some problems the next day with complaints of missing VAD Wind Profiler information. After I rebooted the RPG, this cleared up the problem (once again, learn from my mistake). Despite all the delays and setbacks, we actually made out goal of completing the ORDA installation on time. We conducted out out-briefing around 5 pm that afternoon.

Summary & Closing Comments – This turned out to be a very good time to talk hard-core "nuts & bolts" with the installation team, and the lead contractor engineer about my radar system. I enjoyed exchanging "tips & tricks" along with a lot of other really nice-to-know information. Don't waste this opportunity! I found the entire process to be very educational, and

I really got to learn a lot about my new ORDA installation as it was installed. I think this offers the site electronics technician an excellent opportunity to start off on the right foot with your new system.

I hope I didn't scare anyone into thinking the entire ORDA installation process is something out of a horror movie – it isn't. I do wish that other sites would learn from my observations and notes. I also discussed our mistakes so as to hope no one would repeat them. I have really dwelled upon the importance of pre-preparation to the point where it might have seemed overbearing. But after having completed this entire process myself just 24-hours ago, I feel it was necessary. It is my genuine hope that this paper offers some value to everyone reading it, and dispels some of the ambiguities you might have about the process. I hope I have achieved my objective of painting and clearer picture of the ORDA installation process and what you can expect when your scheduled time comes. I hope you prepare and that your installation goes well!

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