H-Field & E-Field Kit Initial Setup Instructions

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Weather Station Hardware => Blitzortung => Topic started by: Cutty Sark Sailor on May 23, 2014, 06:37:15 AM

Title: Adding E Field Probe - Startup and Operation - not for construction
Post by: Cutty Sark Sailor on May 23, 2014, 06:37:15 AM

Adding the E Field Probe... a first impression primer...
We'll evolve / correct this as we go with info, tips, etc....hopefully.
It's different! ... and this is based on initial 'experimentation'...

- Updated: 5/25/14 :spectrum comparison: :operation: :enter your antenna type!:
- Updated: 5/27/14 :filters description Â± :roll: : signals example image : system gain and filter specifications :
- Updated: 6/1/14 :qualification sentence modified under "suggested initial settings" regarding filters
- Updated: 6/10/14 :qualification sentence added under "operation with automatic and filters" stating return to full 'manual' mode for operation
- Updated: 6/16/14 :Example and explanation of Alternate Channel Mapping from Don Froula, sta 681, is added to here.
- Updated: 6/17/14 :Simplified threshold set up --- thanks Don Froula, sta 681

Two Important Notes!

1. Please use controller Amplifier 2 for E fields... that insures the signals displayed are shown in consistent colors. We'll then expect H field signals (Amplifier 1) to be Red and Green (with Channel C Yellow normally not shown) and E field signals to be Magenta, Blue(Teal) and Orange. Avoids confusion if we're trying to help you.

2. Make sure you are not running a second Power Supply into your new Amp, other than for initial build test. Only the Controller supply is required, and the 2nd power supply will cause all kinds of issues... especially since it will likely affect the HP filter in addition to working against your primary controller supply.

Looking at signals:

Here's what we've become used to with H field only: 2 Channels with directivity at right angles. Amplifier 1
When we first add the E field probe we'll see this: 5 Channels directivity - any direction! Amplifiers 1 and 2

Here's the E Field alone: 3 Channels directivity unknown. Amplifier 2
One of the first things we notice is it may be difficult to locate an E field noise source, since we are missing one clue available with the H field directional loops... we can't get pointed in a line to begin source location and identification. Those of us who've been around awhile understand this, if you're new you may not as yet.

As when we first began with H field only, we need to explore our E field environment, so we need some control over the amps and channels as we tune and refine over time.

**Suggested initial settings:**

**Remote Control**

<table>
<thead>
<tr>
<th>Mode:</th>
<th>Manual Mode</th>
</tr>
</thead>
</table>

**Tracker**

- Auto Adapt to Noise: [ ]
- Auto Amplitude Filter: [ ]
- Number of Samples: 512
- Samples before Trigger: 256
- Ignore Signals below Threshold: 10%

**Sampling**

**A/D Converter**

- Force all channels on: [ ]
- Alternate channel mapping: [ ]
- Cycles p. Sample 1: 56
- Cycles p. Sample 2: 28
- Resolution: 12 bits
- Clock Divider: 2

**Run in manual mode.** You want control with fixed parameters for awhile.

**Turn off (uncheck) "Auto Adapt to Noise" and "Auto Amplitude Filter".** If you leave them on the following initial setup may cause confusion. Remember that E field will not be as vulnerable to Magnetic interference, and will exist in its own VLF environment.

A few folks have attempted setup disabling Amp 1 by unplugging the amplifier. I do not suggest this for several reasons not described here. Operate the system under full load, and after making...
the initial settings, perhaps reduce the gains on Amp 1 to allow Amp 2 to dominate the signal display. You could turn those 2 "autos" back on as you see fit at any time, and see how they perform with the new E field operating alongside H field.

Enabling "Alternate Channel Mapping" allows independent adjustments of both amps' thresholds, which can be bit tricky for the "C" Channels, unless we share Don F's elegant "Keep it Simple" solution:

1. Check (turn on) "Force all channels on" and "apply"
2. Set Amp 1, Channel C to the minimum value, 1mV.
3. Apply, and then "Save Settings".
4. Un-check (turn off) "Force all channels on".
5. Apply, then "Save Settings"

Now, the Amp 2, Channel C threshold will be assured of being the value you set in the Amp 2 settings.

Why do this? If you do not you are likely to assume that you've actually changed Amp 2 Channel C's threshold, because both the settings page, and the signals page information will show you the numbers you've entered. And you'll not notice that the actual DISPLAY trace shows the TRUE operating threshold level for Amp 2 Channel C! This may possibly be addressed in a future firmware update.

H-Field & E-Field Kit Initial Setup Instructions

Don F. Includes larger explanatory images)
See the link above the images for further details.
Don't read the following if you're already too confused to proceed... Otherwise go back and start over, or just follow Don's short cut above, and move on.

Now this gets a bit mind-bending:
We need alternate channel mapping, to be able to manipulate thresholds, and therefore "relative" gains, when we add the E field to an H field setup.

When we do this:
- Threshold settings for Amp 1 for channels A and B will be identical, and shared, that is, thresholds for A and B will become the higher setting originally set for one of the channels. Ditto for A and B of Amp 2. However, BOTH amps' Channel Cs share the same ADC, and therefore one will assume as it's lowest possible threshold, the highest threshold set in either amp. You cannot set a threshold for 2C, in other words, that is lower than the saved threshold already established for 1C. And vice versa. Since C isn't used on H field, and the threshold setting isn't visible to you, you must check 'Force all Channels On' to see it. Now you can use Don's method, and complete your E field set up, running E field on Amp 2 as we strongly suggest.

Moving on: Note here: E field First Stage amp is shared by all three channels... one adjustment (C) for all. 2nd Stage is individual channel adjustable. The third and final stage gain is fixed at 10 for Channel C, and at 16 for A and B. (In the H Field amp, the final stage is fixed at 40.)

One of the issues here initially may be interference mode. The 5x5 gain settings for this location with a 15” 12ga wire probe is quite high enough, so far. It'll pick up signals with higher gains
that can't even be located. With any activity within a few hundred miles higher gains are useless. 
E field is very sensitive to the charges in the clouds, much more so than the H fields.

**Courtesy of Richo Anderson and Blitzortung.Org:**
E-Field typical Gain Potential (reason for tight filtering)

I can see one issue easily happening... someone will use a large antenna, and wonder why they have so much 'interference' mode operation. Trust me, that 15" probe is almost too much. With storms within 200 miles, I had its gains down to 2-1... too many signals, too fast... remember, that's really what threshold is responding to.

**Find your recent signal spectrums:**

[http://lightningmaps.org](http://lightningmaps.org)

Make sure you log in with your BO username and password / Your Region (America, Europe, Oceania, etc) / Archives / List allow patience while server and internet catch up with you...
Most noticeable are the sharp peaks and frequency bands between the 3 channels of the E field system. Theoretically, for example, I believe you can minimize an interference from a source, say at a constant 24kHz, by adjusting the gain and threshold for a particular channel. The filtering built into the E field system is extremely tight and critical. Note that such adjustments are only possible on H field on one channel, in one plane of directivity. Being Omni, and three channels may offer us an opportunity to minimize E field interference by simply determining it's frequency without affecting overall detection range and signal location. Time and experimentation will tell. Cool, huh!

Filters:

The coax and it's shielding is effectively part of a **High Pass filter > 5 KHz** (preamp, coax, amp combined)
First stage HP filter is in Pre-Amp, third stage in amp.
50,100,150,200,250 Hz is effectively attenuated
Similar with 60Hz and harmonics

- 18 KHz
- 44 KHz
- 50 KHz

Â± effective channel selectivity

- **A = 5KHz Â± â€” 23KHz Â±**
- **B = 18KHz Â± â€” 44KHz Â±**
- **C = 5KHz Â± â€” 50KHz Â±**
Courtesy of Richo Anderson and Blitzortung.Org:
E-field Filter operation (measured at -3db)

The below illustrates differences in 4 stroke signals, from 2 stations approx. 100mi separation N/S.
First in each set, station operates with both E and H fields, alternate channel mapping. Second station operating H field only.
These two videos will illustrate the difference in filtering, with server signals spectrum, between the two systems. Both amps operating in manual, no filtering, with somewhat reduced gain:

**E field Only** Click the image to open player.
**H field only** Click the image to open player.
Didn't Richo build some great filters???

Update: Here's one on me ](*,)
One of the guys in Europe, running his E field through input A,...
3 Beautiful signals, except they're Red, Green, and Yellow. Yellow's got a bunch of noise on it,
and the whole left side of trace is sinusoidal. He wants to know what's wrong. Me? Guess what?
Looking at Red, Green and Yellow, I'm thinking 'H field' interference, naturally. :oops: So comes Tobi... "That's just noise on the Yellow..."....

As I stated earlier: "This Is Different". The above might have been a problem for H field... but
was near 'normal' for E field. :roll:

... and so it begins...

---and so it continues:

Operation: May 25, 2014 - linked video may help visualize some of the capababilities and
potential of dual operation. 
After some experimenting, and familiarization, it appears that running both H field and E field together just screams for Automatic Mode. 
So, upgrading now to latest firmware, (at the time, 7.05b) in this case, we set and applied

**Enable Channel Mapping:** On
**Gains**
1 A and B: 10 * 10  
2 A, B, C: 10 * 5
**Thresholds**
1A, B: 110 mv  
2A, B: 90 mv  
1C, 2C: 90 mv
**Auto Adapt to Noise:** On
**Auto Amplitude Filter:** On
**Remote Control Mode:** Automatic

Saved settings.
And recorded the following video - It will present best if set to full screen when the player opens:

[Click the image to open player.]

Station 689, Frankfort KY, USA, with light continental activity 1136UTC to 1146UTC
5/25/2014 More notes are below:

**NOTE: June 10, 2014**

After about 2 weeks operating with filters and "automatic" as outlined above, I did not change my mind on firmware/software operation with some type of "automatic mode". **However,** I did decide that the present server and controller firmware, at least for my station and location, actually caused a decrease in overall performance, with the present density of the North American network. So I turned off both the filters, and returned to manual mode with alternate channel mapping. (css)
Unfortunately, there is no split-second time relationship between the signals... Lower right is real-time local controller signal.
Upper left is a 2.5sec interval BO server signal, as is the spectrum on upper right.
Lower left is real-time strokes and station visualization with approximately 5 second delay.
The video should be long enough to get a good idea of how the server and controller will work together to adjust gains and thresholds as required, with channel mapping and full automatic, even with the present server algorithms, and controller firmware. Watching the lower right over time and signals note how the gains and thresholds are varied. Upper left will show you which channel the server is currently selecting for use 101 indicates used, with the vertical red bar on the TOGA/TOA location. 100 is received, not used.

**On the Controller signals page, for those who don't know:**
- L = Signal is below the threshold
- P = Signal is below threshold * adjustable_percentage
- S = Spike detected
- M = Amplitude too high (currently not enabled)
- A = Automatic filter by amplitude
  Filters are always on. If a channel is marked red, then it might not be used for sending. Only if the time above the graph is red, the whole signal won't be sent. Some filter flags like "L" or "A" must be present on all channels for that a signal to be NOT sent ("AND" condition). Other's, like "S" need only one filtered channel, and the whole signal won't be sent.

If you haven't already, you should set your antenna types (Thanks, Don F) Settings on your member information page at login on Blitzortung.org:
If E Field is on Amp 2, you'll skip 'input 2' since the C channel on H field has no antenna... yeah, the numbering begins at "0" There's popup help for the settings. Settings are metric, btw. It is very important that they be set correctly.
Another setting to make on that page is your City, State, Location... and if you have a website, that's very cool to enter...