Advanced NBEMS

ARRL Western Pennsylvania Section

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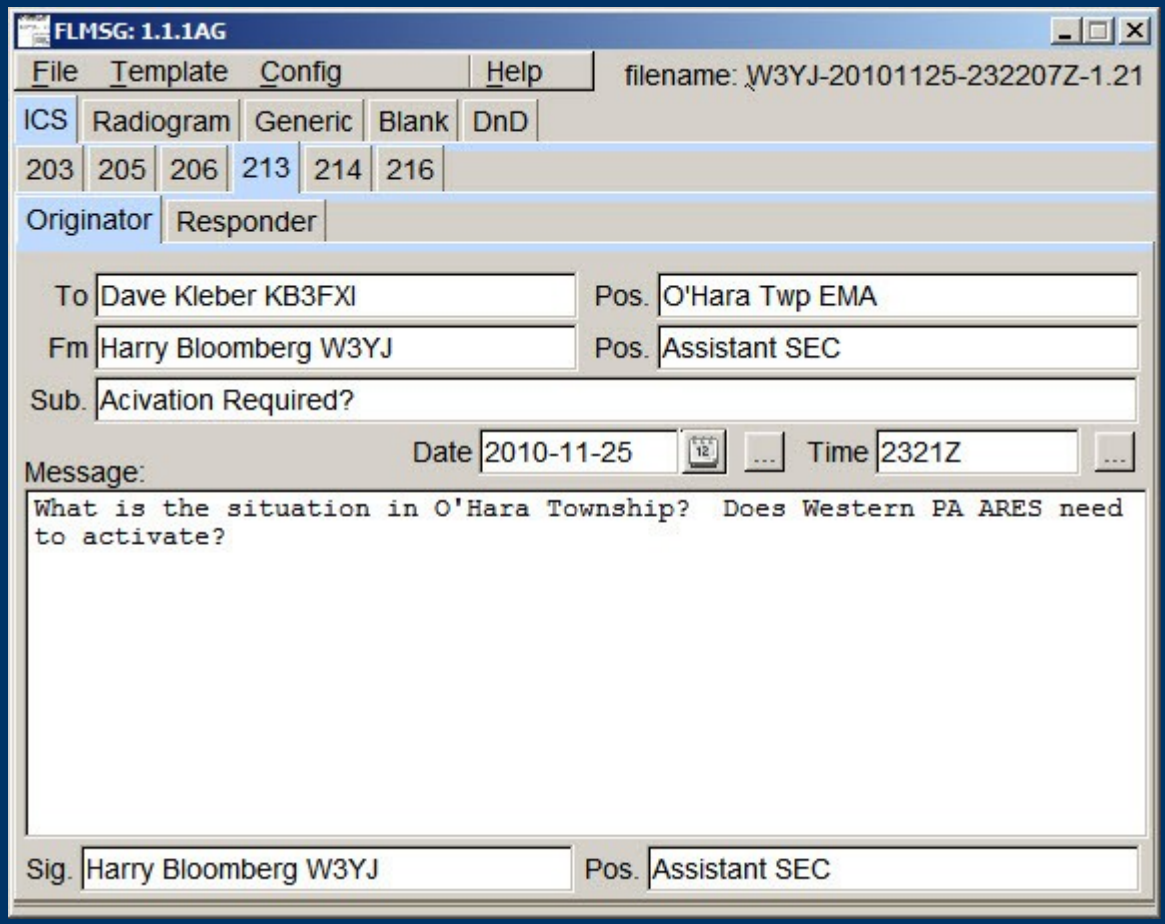
Advanced NBEMS features

- Flmsg – ICS and ARRL Radiogram forms
- High speed NBEMS modes
- Data compression with flwrap
- Advanced file transfer with flarq
- RSID for auto mode change of unattended system

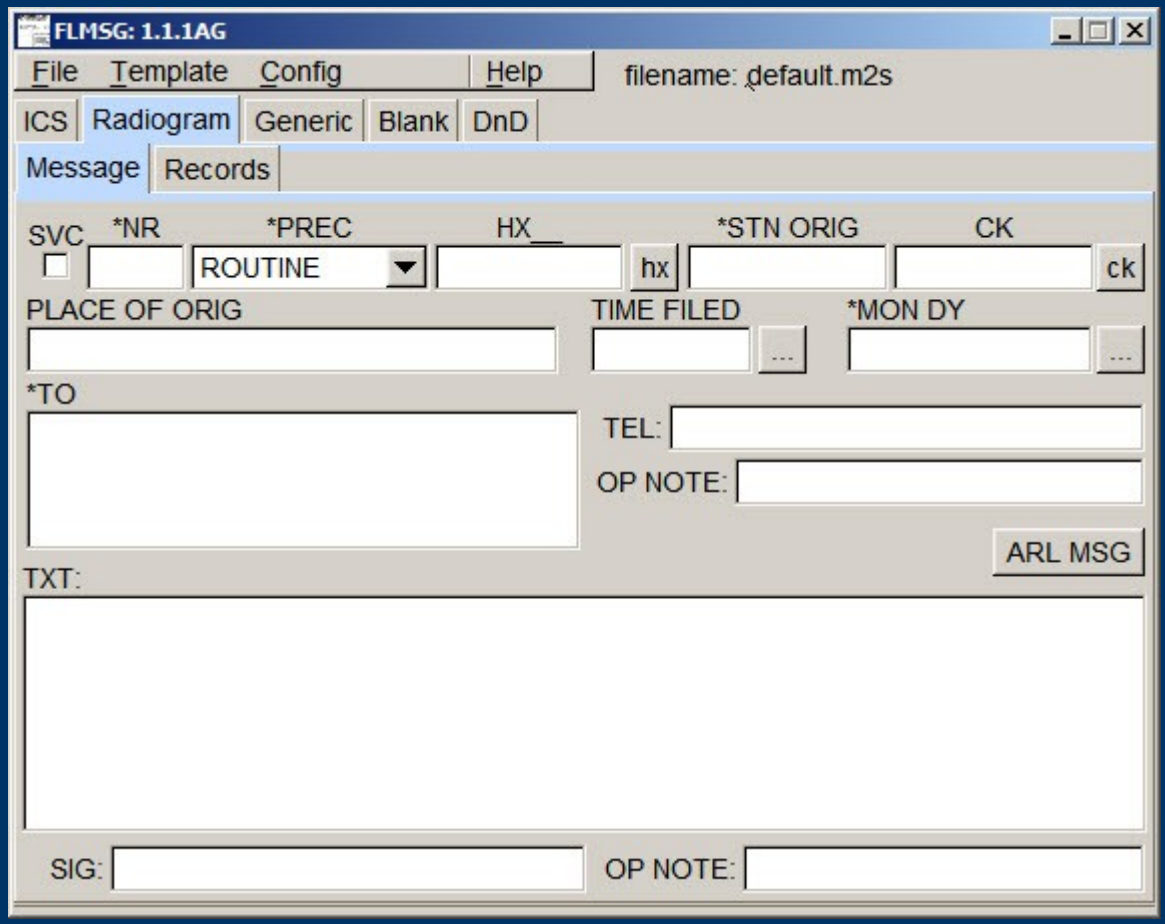
Flmsg – send ICS-213 and ARRL Radiogram

- Flmsg is a powerful addition to NBEMS
- Can send ICS and ARRL Radiogram forms
- ICS forms include (as of Nov 25, 2010):
  - ICS-203 Organization Assignment List
  - ICS-205 Incident Radio Communications Plan
  - ICS-206 Medical Plan
  - ICS-213 General Message (most common)
  - ICS-214 Unit Log
  - ICS-216 Radio Requirements Worksheet
- Can send files and receive files very easily with 100% verification

Flmsg ICS-213 screen

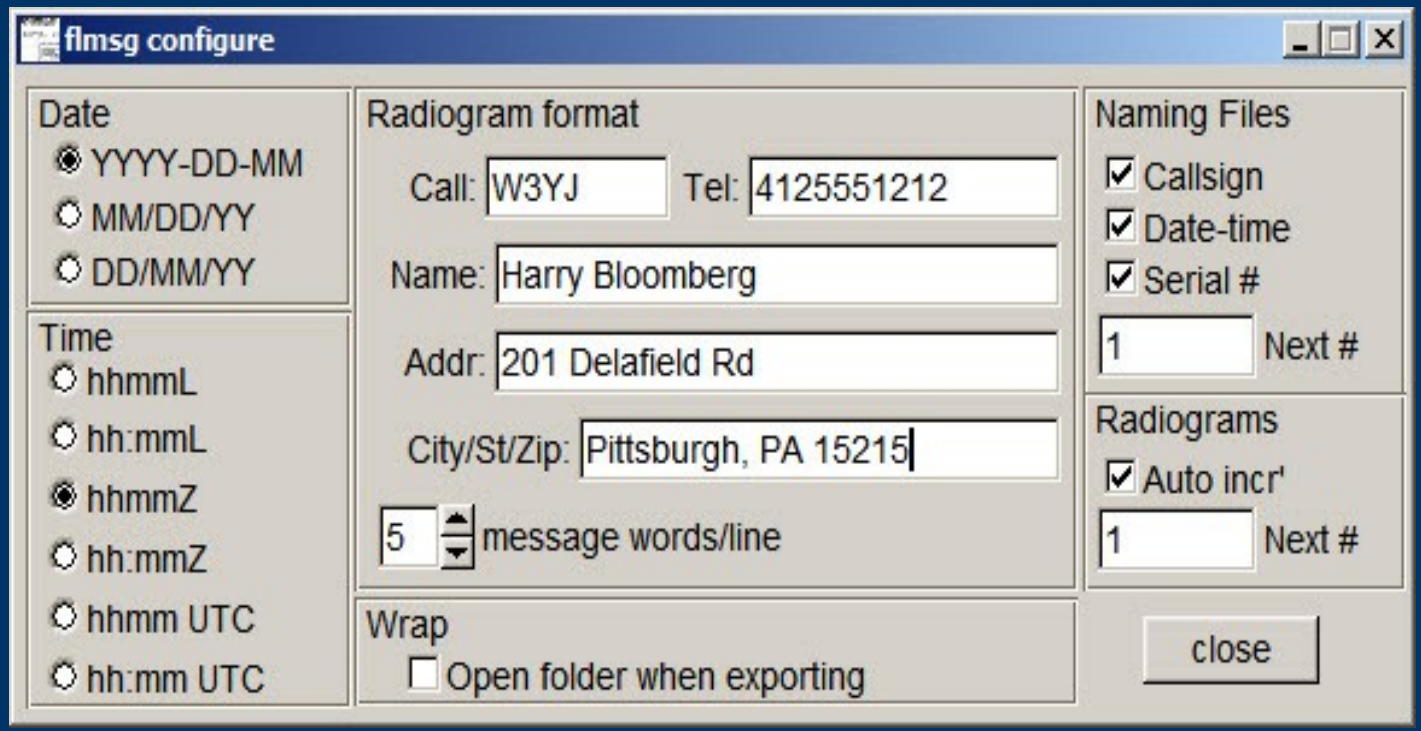


Flmsg ARRL Radiogram screen



Flmsg - configuration

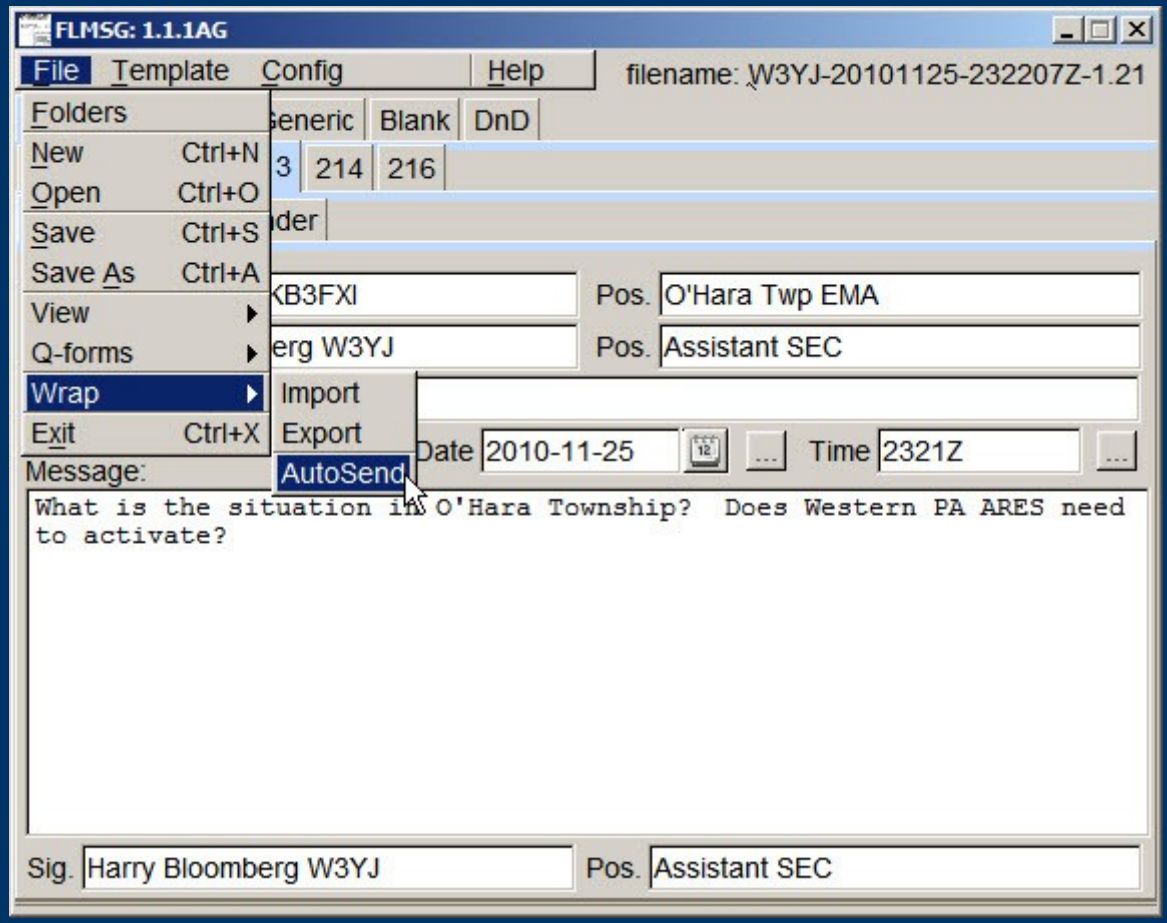
- Click on Config menu
- Enter your preferences and info



Auto sending ICS-213

- Start Flmsg and Fldigi
- Select ICS213 tab
- Fill out ICS-213 form in Flmsg
- In Flmsg:
  File->Wrap->AutoSend
- Will be asked to save file
- Message is automatically wrapped and transmitted!
- It's really that simple!

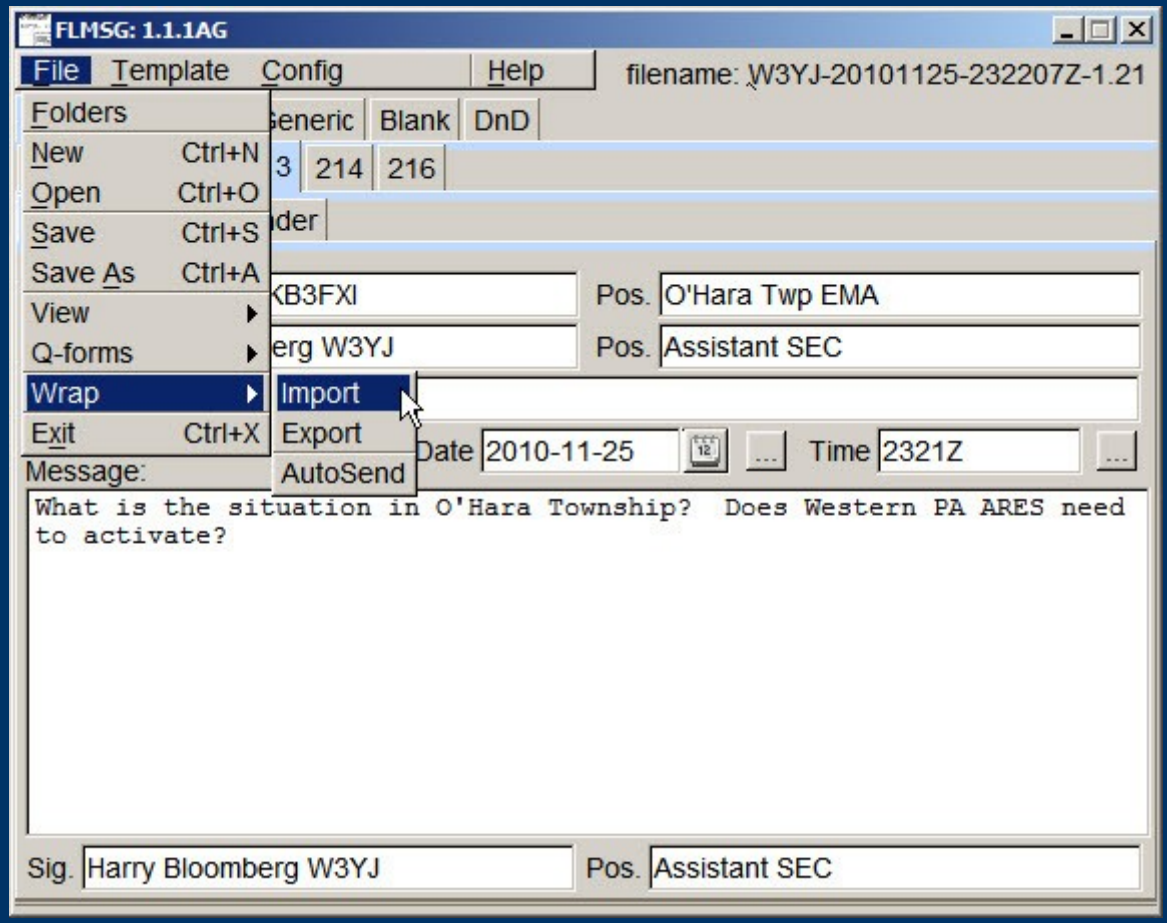
Auto sending ICS-213



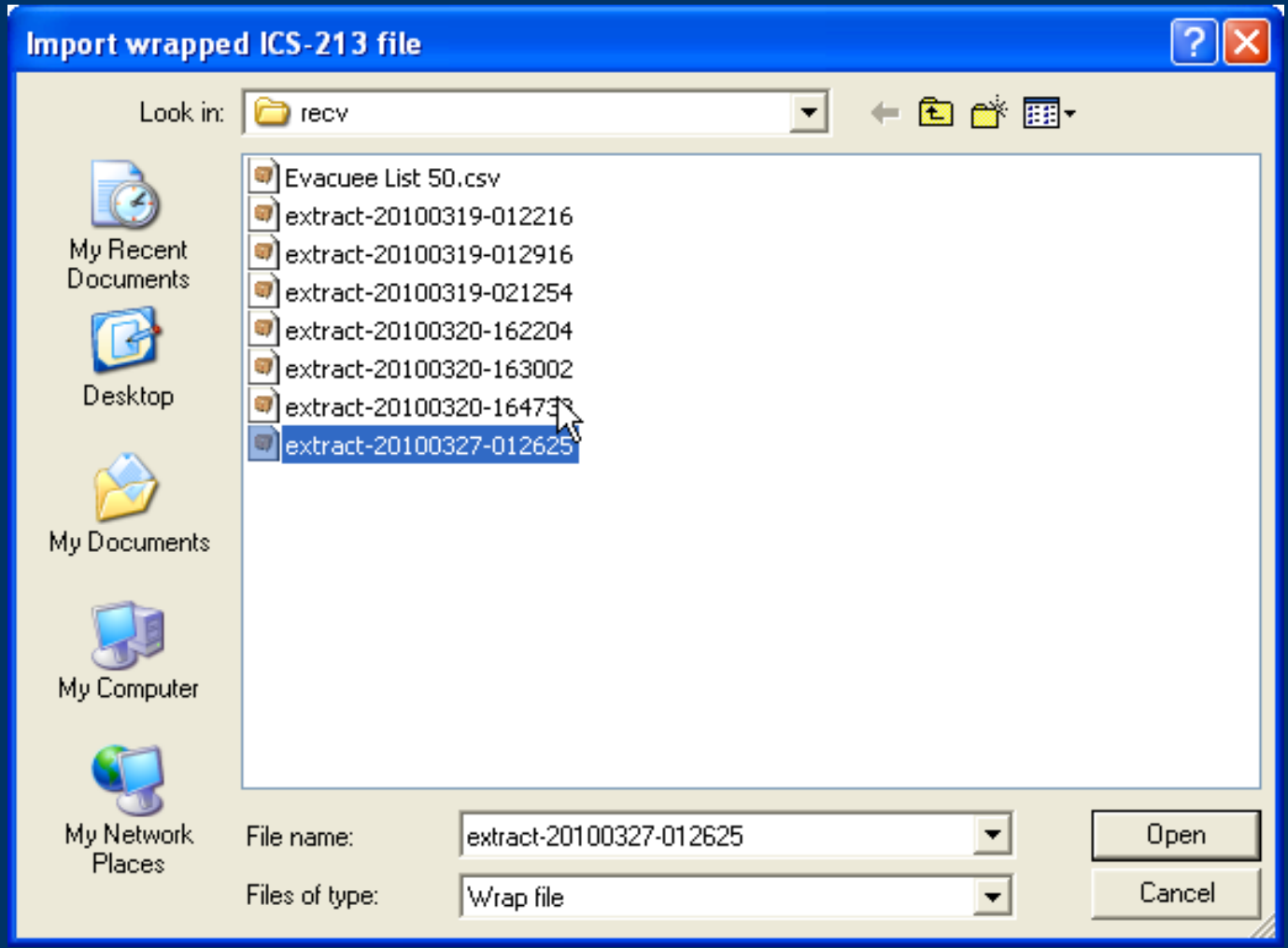
Receiving ICS-213

- Receiving ICS-213 is very easy also
- Watch your Fldigi screen to see that the incoming file has been received
- In Flmsg:
- File->Wrap->Import
- Select most recent “extract” file
  This is at bottom of page
- File will be imported into Flmsg

Receiving ICS-213



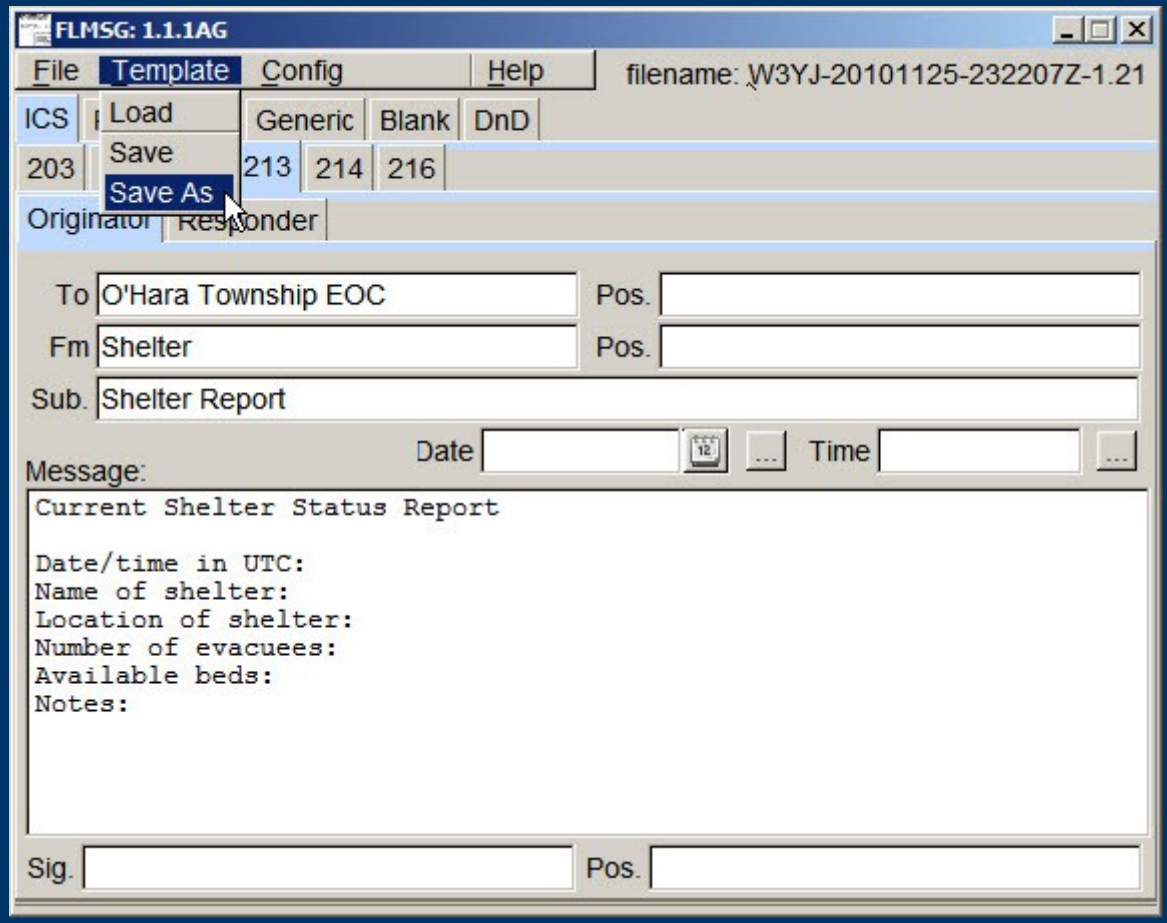
Receiving ICS-213



Flmsg templates

- Say you need a standard report for...
- Hospital situation report
- Shelter info
- Any standard format for situation update
- Flmsg supports templates
- Distribute before event, or even over the air
- Import template into Flmsg, fill it out and transmit
- Use Template menu to save and load

Flmsg templates



Outputting ICS-213

- Want to print message?
- Or maybe email as an attachment?
- Can output message in HTML
  File->View
- Very polished, professional looking output!
- Will impress your EMA director with an authentic-looking output

ICS-213 in HTML

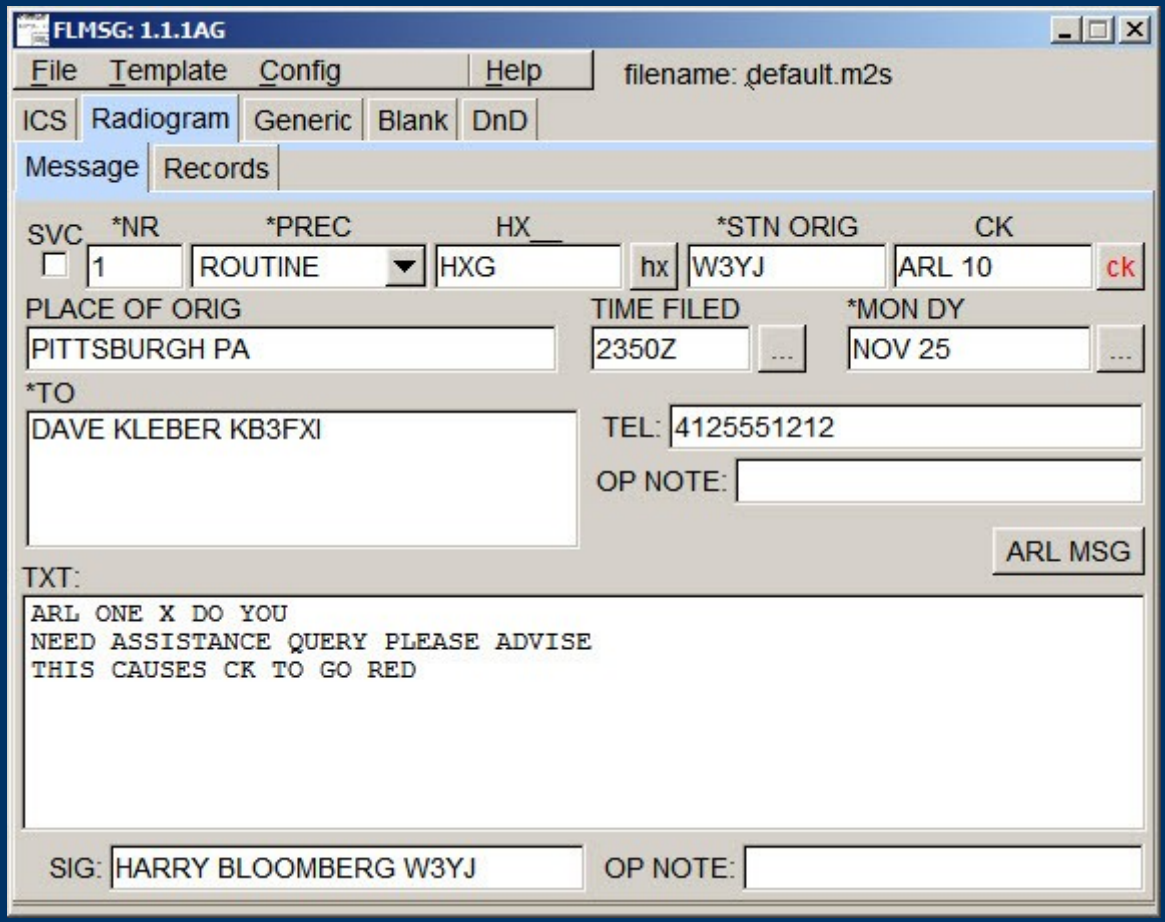
GENERAL MESSAGE
(ics-213)

TO: Dave Kleber KB3FXI	POSITION: OHara Twp EMA	
FROM: Harry Bloomberg W3YJ	POSITION: Assistant SEC	
SUBJ: Activation Required?	DATE: 2010-08-24	TIME: 0054Z
MESSAGE:		
What is the situation in OHara Township? Does Western PA ARES need to activate?		
SIGNATURE: Harry Bloomberg W3YJ	POSITION: Assistant SEC	
REPLY:		
Situation in OHara has stabilized. No ARES activiation required at this time.		
DATE: 2010-08-25	TIME: 0117Z	SIGNATURE/POSITION: Dave Kleber KB3FXI/O'Hara Twp EMA

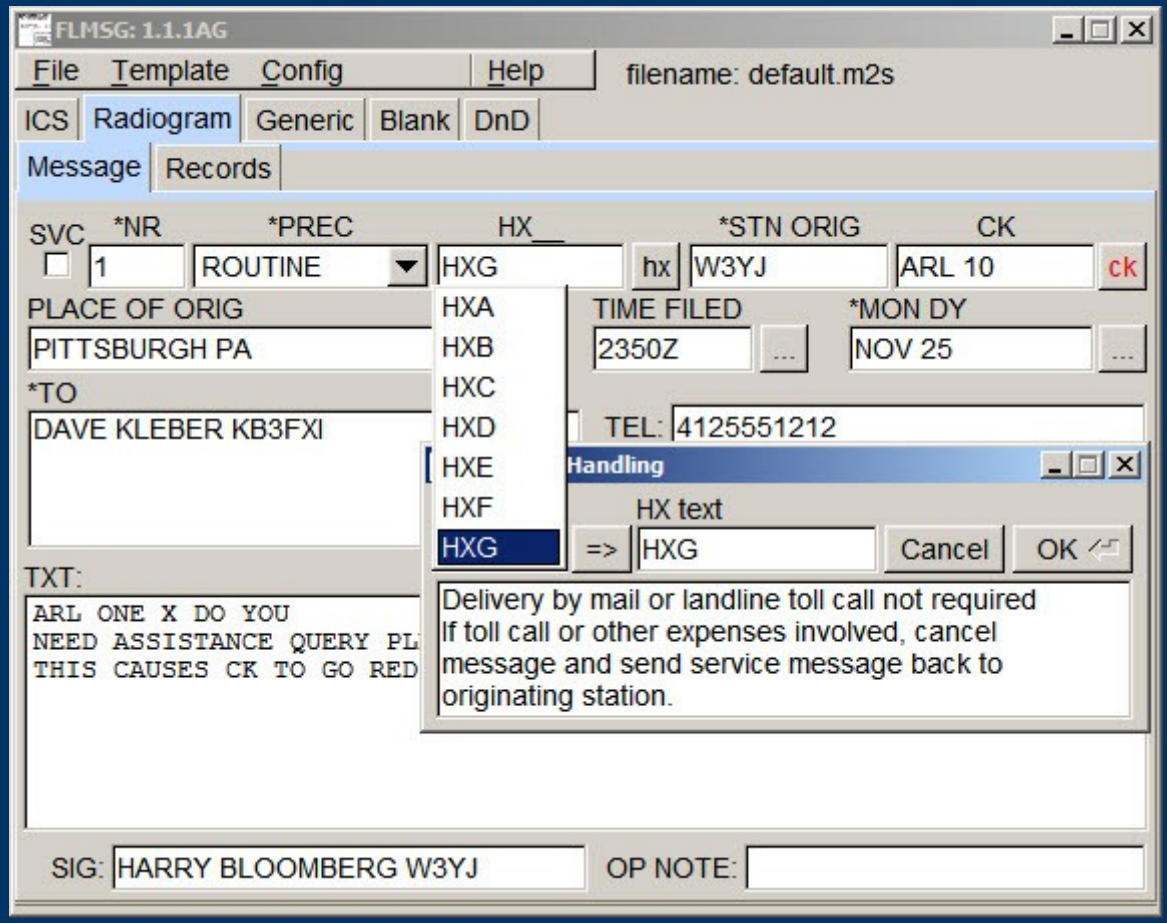
Flmsg and ARRL Radiogram

- Excellent tool for ARRL Radiogram
- Autosend works here also
- Import received files just like with ICS forms
- Automatically computes CK (word count check)
- Reminds you when CK needs to be recomputed!
- Dictionary of ARL messages
- All HX handling instructions
- Output in HTML and plain text
- Plain text great for reading or sending to station not using Flmsg

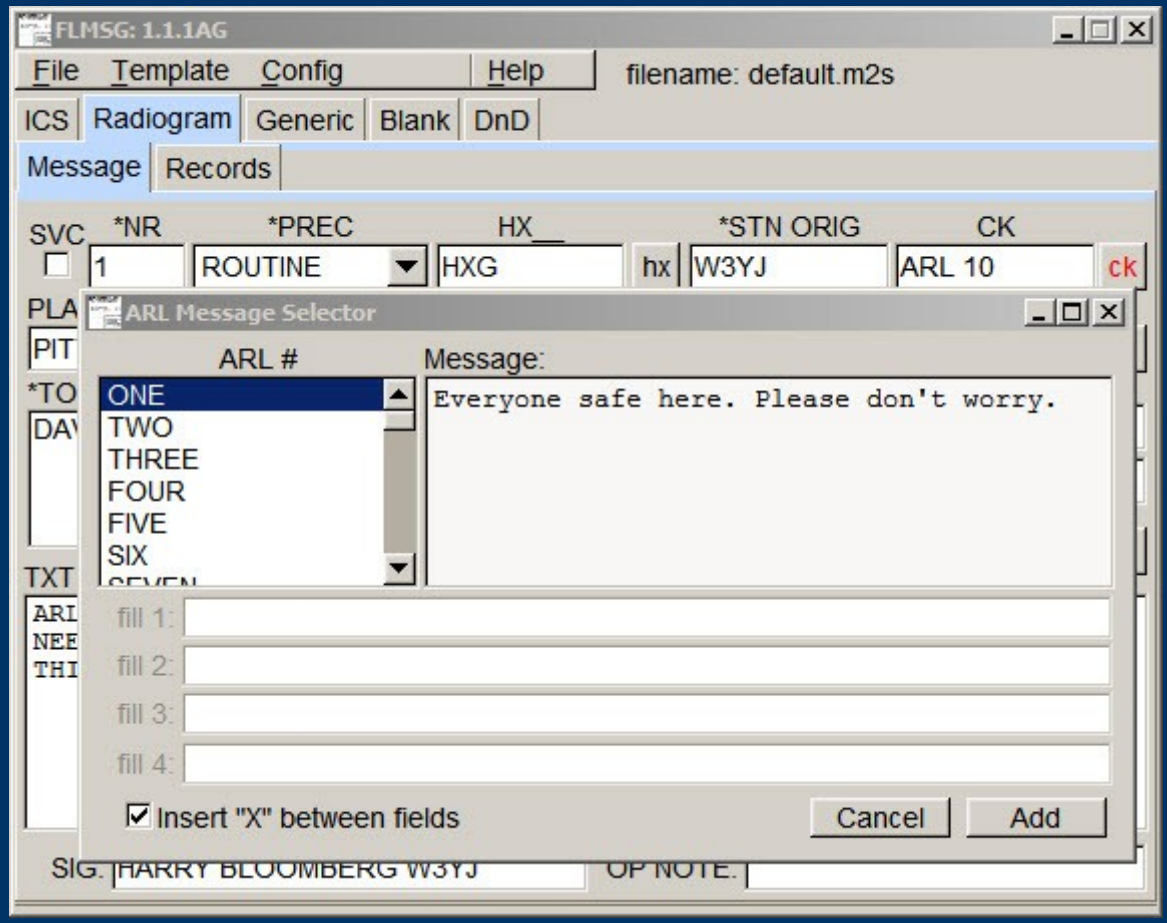
Flmsg – CK reminder



Flmsg – Handling Instructions Tool



Flmsg – ARL Message tool



Flmsg – Radiogram plain text

```
1 R HXG W3YJ ARL 10 PITTSBURGH PA 0101Z AUG 25
DAVE KLEBER KB3FXI
4125551212
BT
ARL ONE X DO YOU
NEED ASSISTANCE QUERY PLEASE ADVISE
BT
HARRY BLOOMBERG W3YJ
AR
```

Flmsg – Radiogram HTML format

THE AMERICAN RADIO RELAY LEAGUE

RADIOGRAM

VIA AMATEUR RADIO

NR	PREC	HX__	STN ORIG	CK	PLACE OF ORIGIN	TIME FILED	MON DY
1	ROUTINE	HXG	W3YJ	ARL 10	PITTSBURGH PA	0101Z	AUG 25

TO	THIS RADIO MESSAGE WAS RECEIVED AT
DAVE KLEBER KB3FXI	

TELEPHONE NUMBER
4125551212

ARL ONE X DO YOU
NEED ASSISTANCE QUERY PLEASE ADVISE

HARRY BLOOMBERG W3YJ

New high-speed modes

- New fast modes now available in fldigi:
  PSK-500R
  PSK-250R
  PSK-125R
- “R” signifies Robust
- Contains Forward Error Correction (FEC)
- PSK-500R is approx twice as fast as MT63-2000

PSK tips

- Fldigi has checkbox for AFC
  - Automatic Frequency Control
- Can be used to track PSK signals
- But...can lead to wandering off freq
- Could lead into QRM
- So, for PSK, try either one of the following:
  - Disable PSK (uncheck AFC checkbox) or
  - Enable PSK, but lock transmit (click Lk button)
  - AFC at lower right corner
  - Lk button on lower right below waterfall

PSK R modes vs MT63

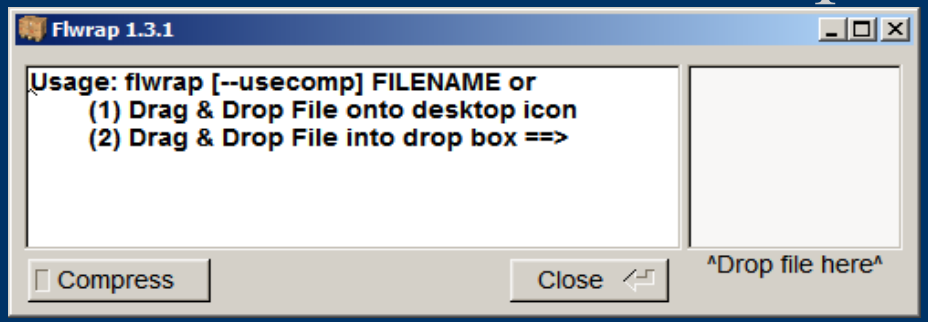
- PSK-500R is faster than MT63, PSK-250R as fast
- Why do we continue to use MT63?
  - MT63 tolerates tuning errors
  - MT63 audio levels can vary widely
  - MT63 works well with acoustical coupling
  - MT63-2000 audio offset fixed at 1500 Hz, not possible to change by accident
  - MT63 is much more robust and forgiving
- We think best use of PSK R modes is on HF or on VHF/UHF FM with flarq

Data compression with flwrap

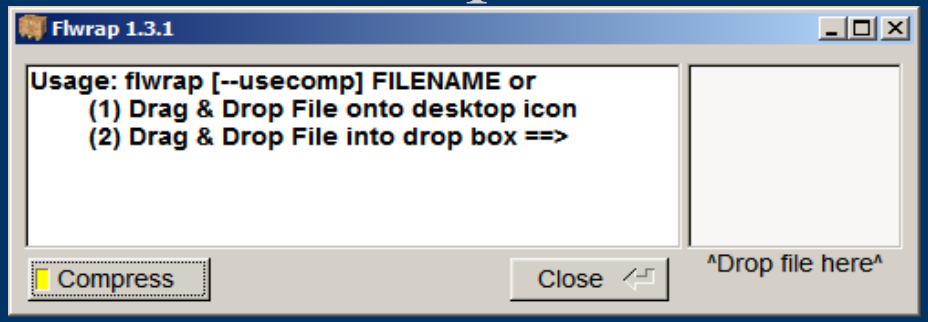
- Flwrap can compute a file checksum and encapsulate file with [wrap] identifiers.
- Can also compress files!
- Much easier to compress files with updated version.

Compressing files with flwrap

- Double-click on flwrap icon



- Press “Compress” button



- Drop file in box! That's it!

Advanced file transfer with Flarq

- Fast Light Automatic ReQuest (Flarq)
- Allows reliable file transfer with handshaking
- Two stations connect
- Data is sent in blocks
- An ack is sent after each block to indicate succesful receipt of block
- Continues until file transfer is complete

Using Flarq

- Two stations establish a connection
- Station A transmits a beacon
- Station B responds to the beacon
- A and B establish a connection
- Either station starts a file transfer
- File transfer either continues successfully to completion or fails
- Another file can then be transferred, or connection broken

Important parameter: Block Size

- Flarq breaks up files into blocks
- One block sent at a time between acks
- You can configure the size of a block
- Bigger blocksize allows faster file transfer but...
- If there's a retry, entire large block must be retransmitted
- Use large block size with good conditions
- Small block size with poor conditions
- In general, use largest possible block size, small block size is a performance killer

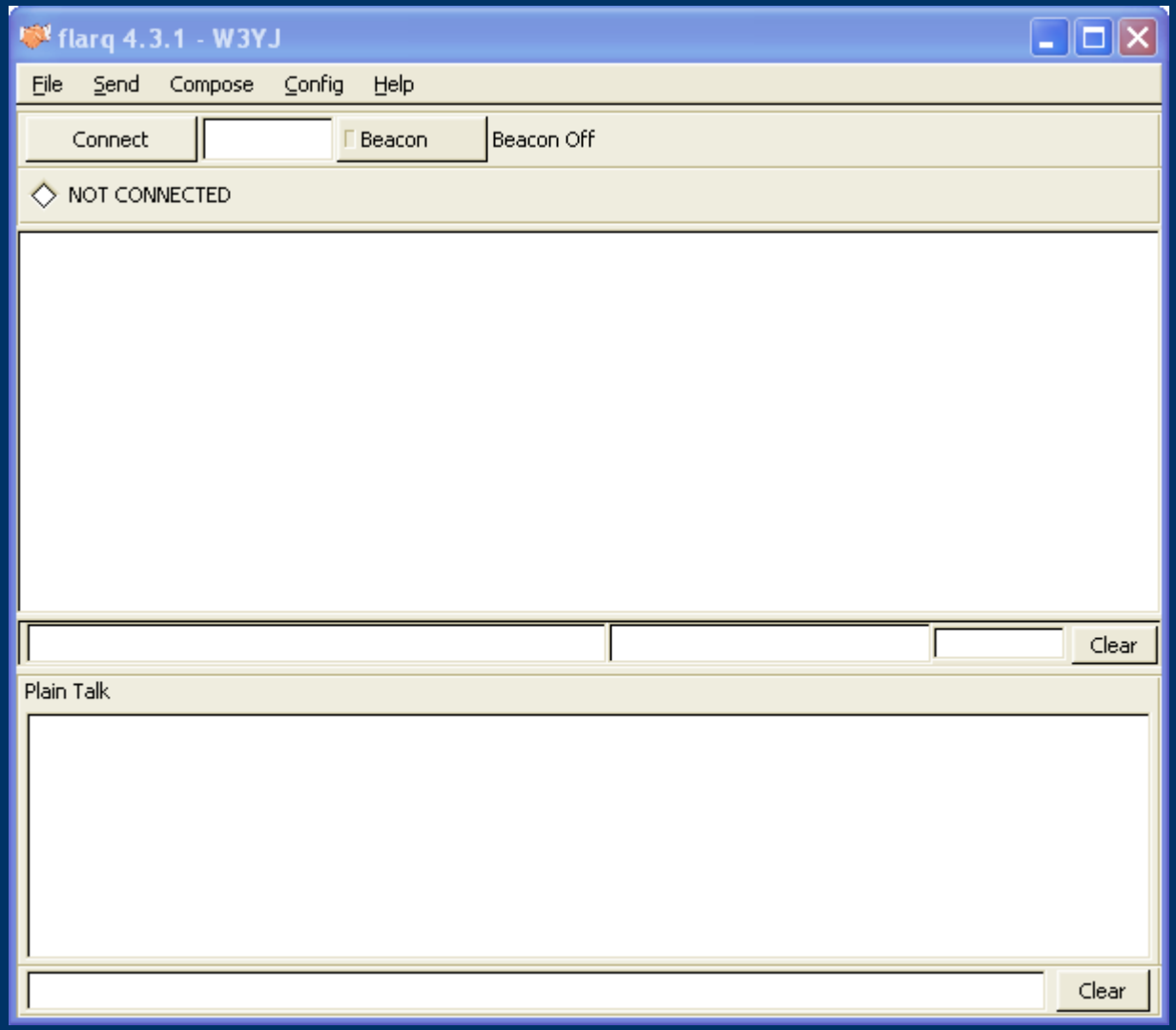
Configuring Flarq

- Go to Configure menu
- Fill in My Call, Beacon Text
- Change Block Size as needed

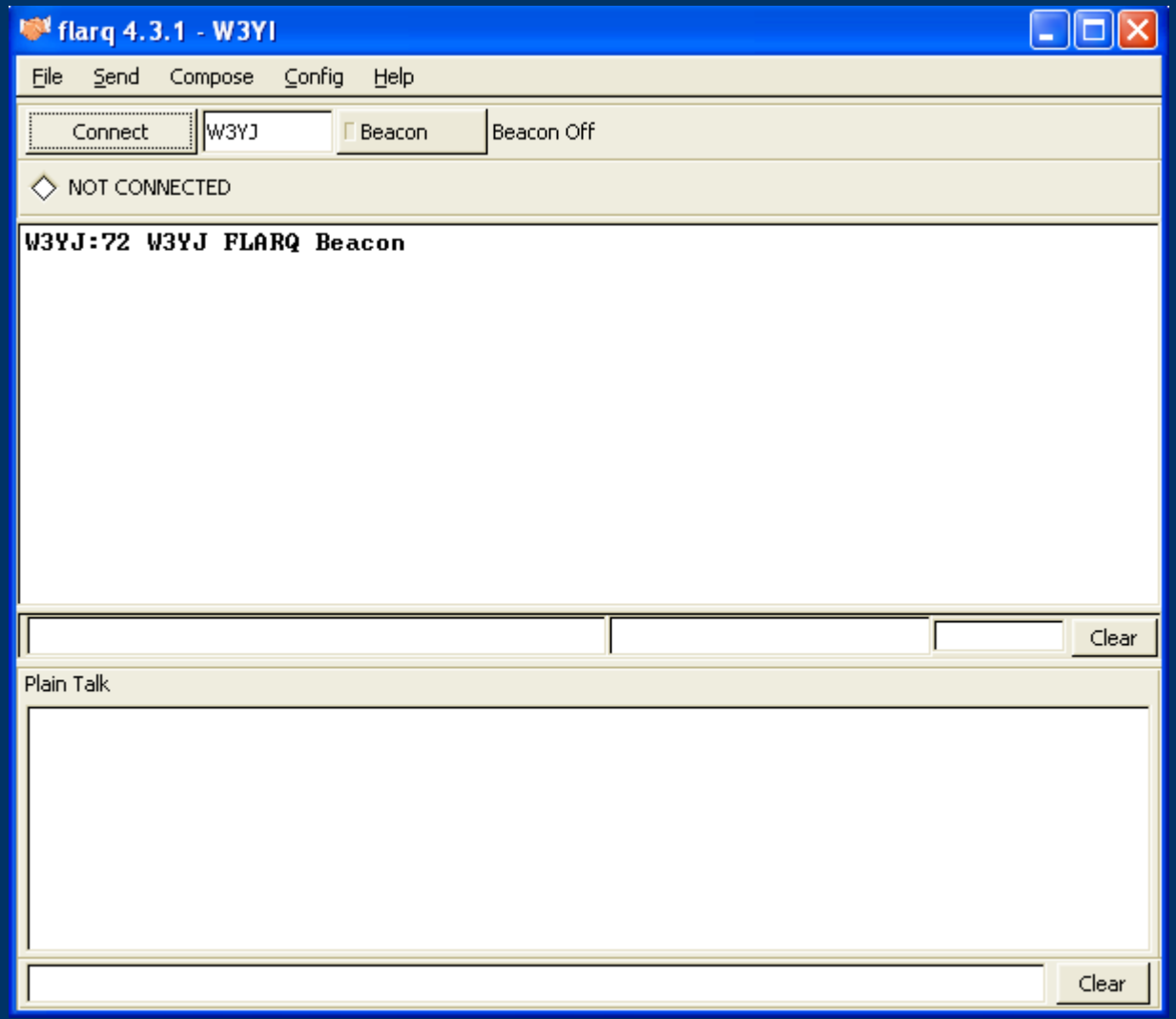
Example of Flarq in use

- W3YJ initiates a beacon
- W3YI responds to beacon
- Stations establish connection
- W3YJ send a file to W3YI
- Two stations handshake until transfer is completed

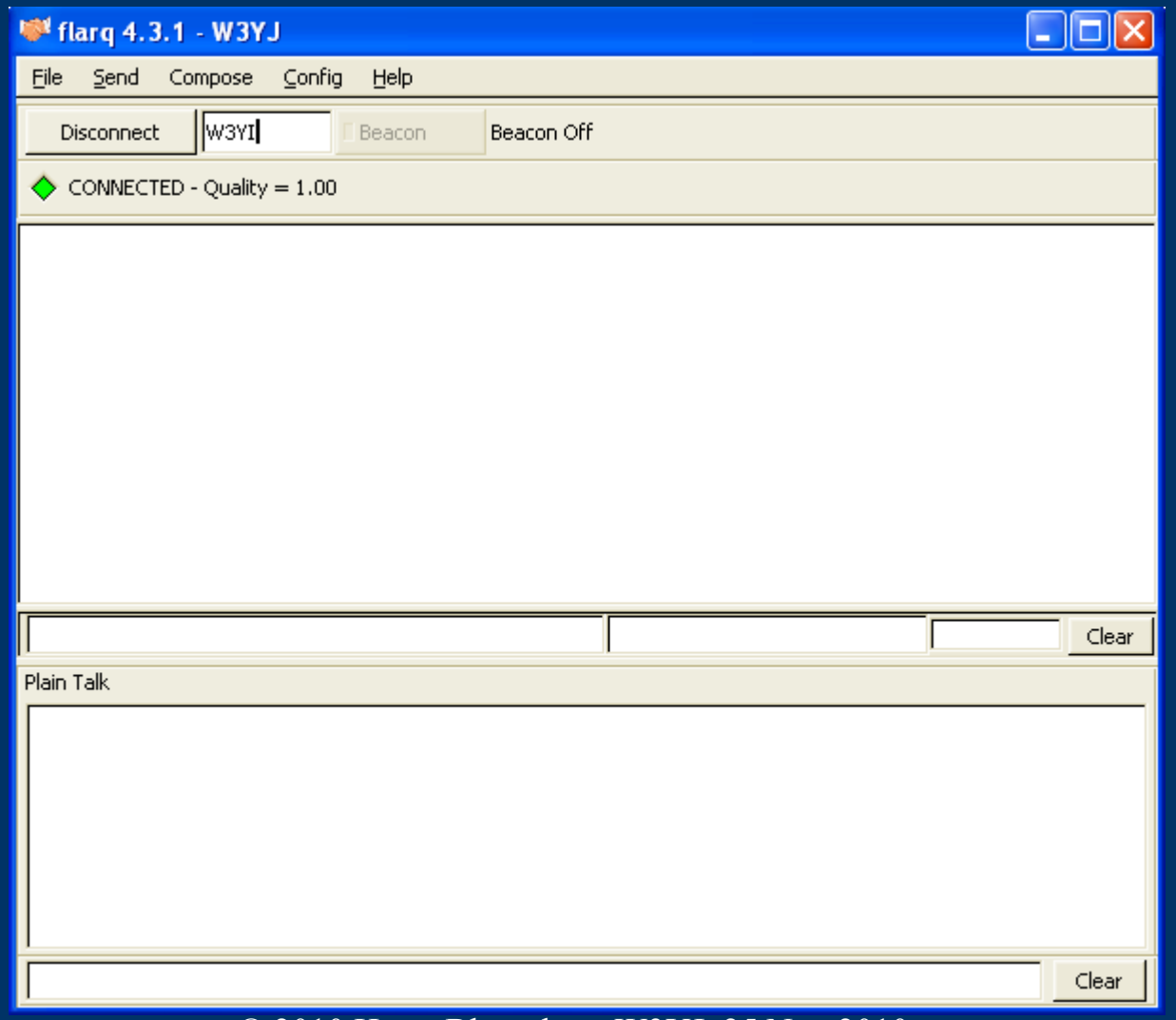
Start Beacon - W3YJ



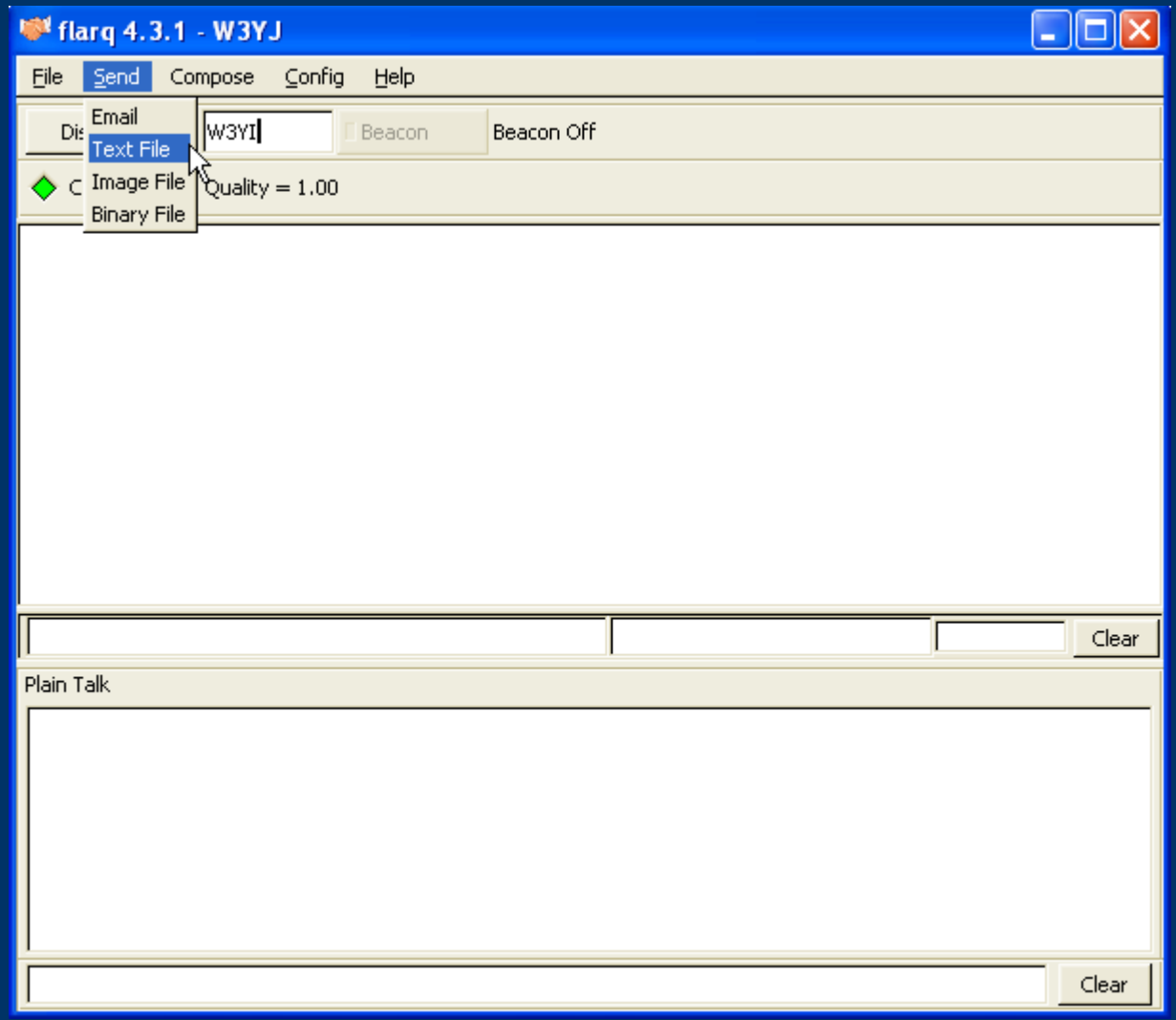
Respond to beacon - W3YI



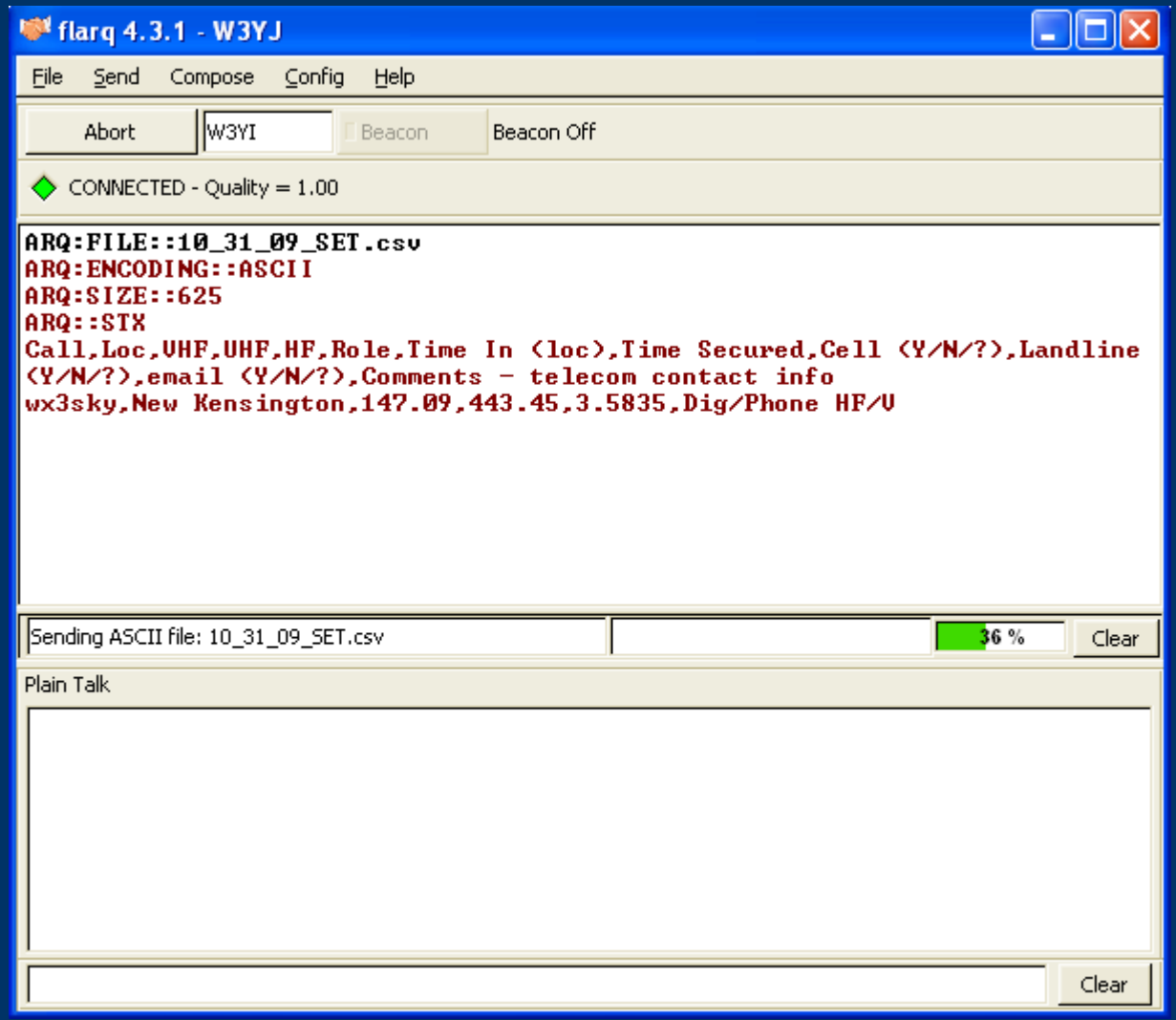
Wait for connection



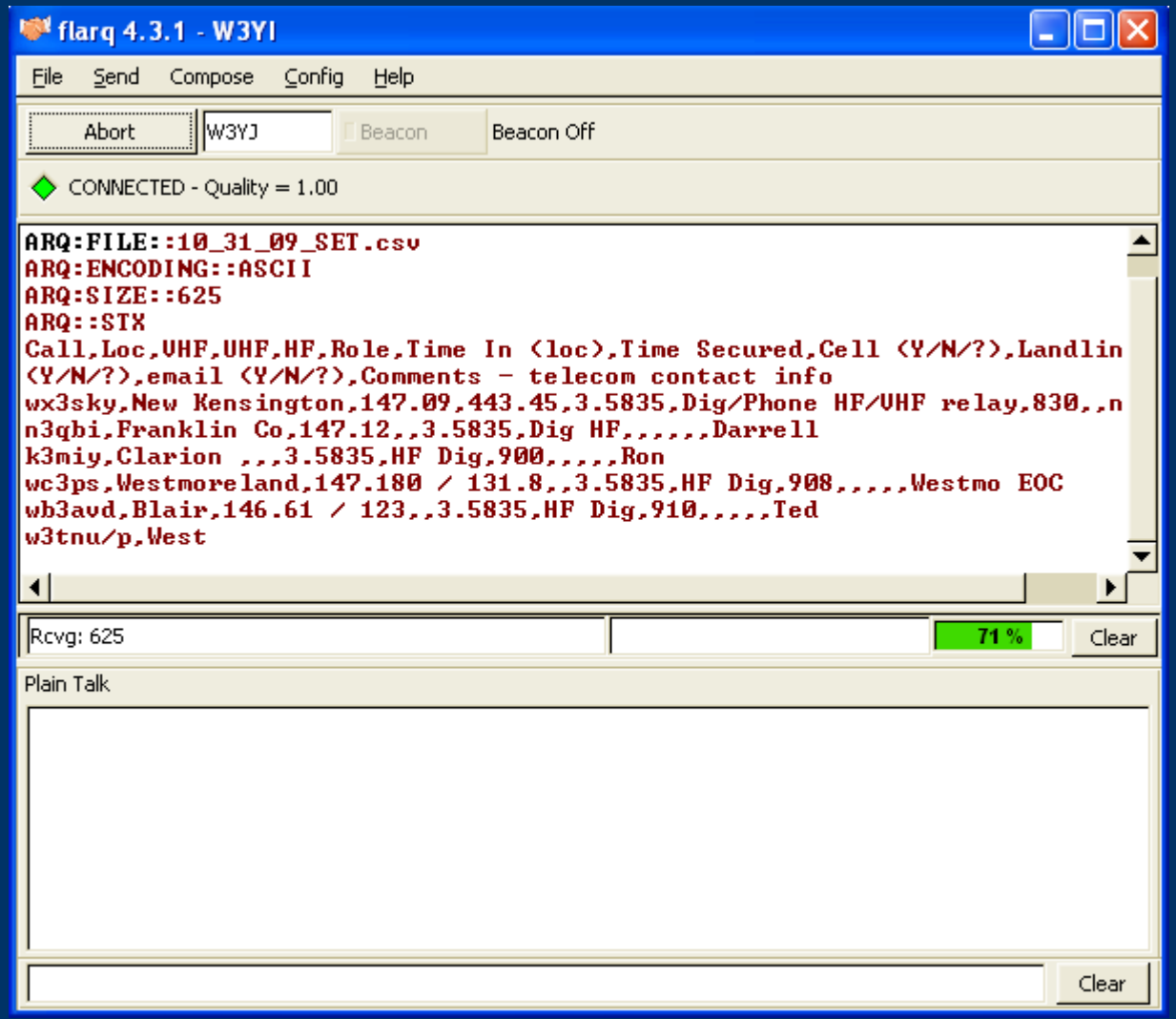
Initiate file transfer – W3YJ sender



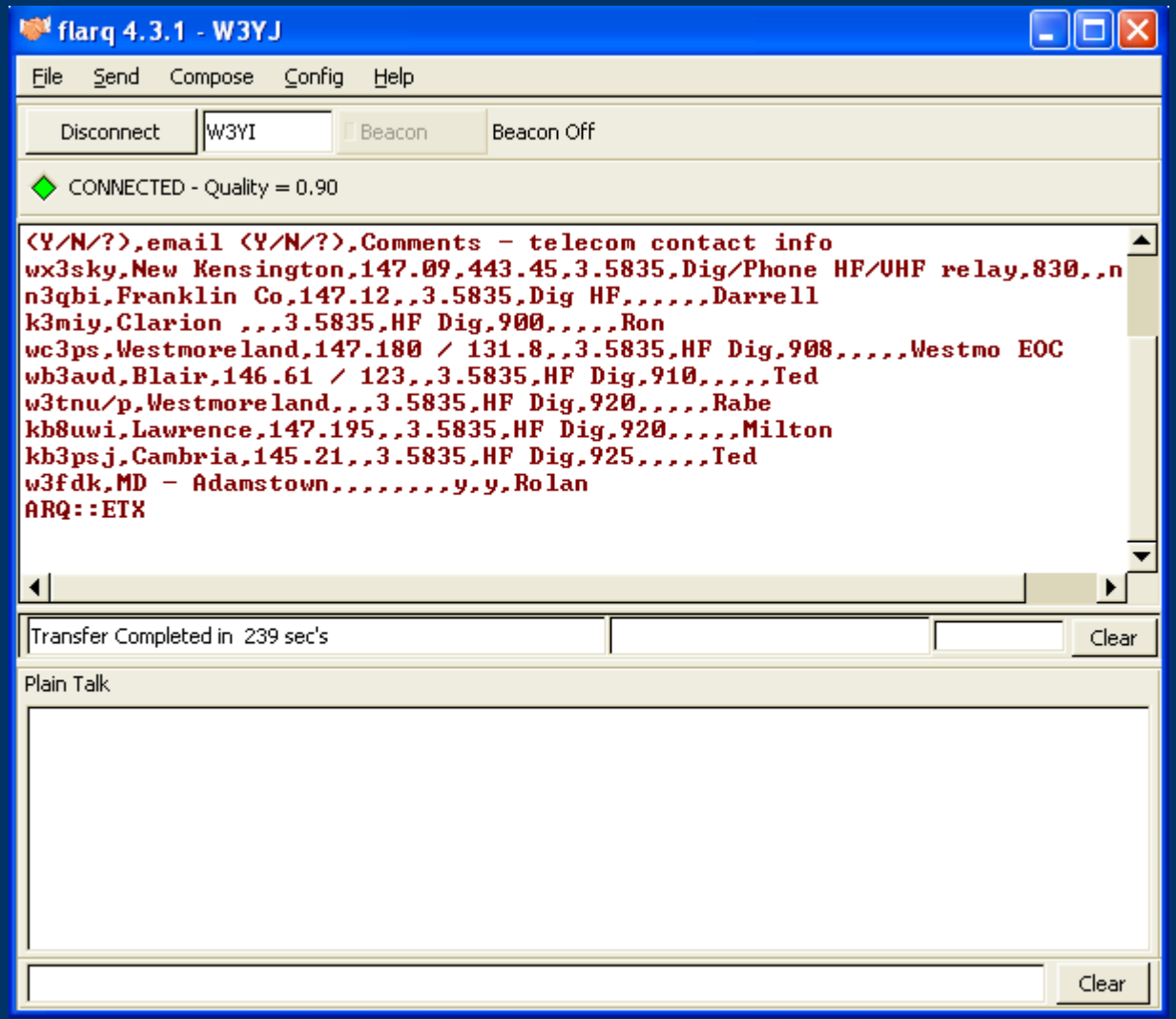
File Transfer – sender viewpoint



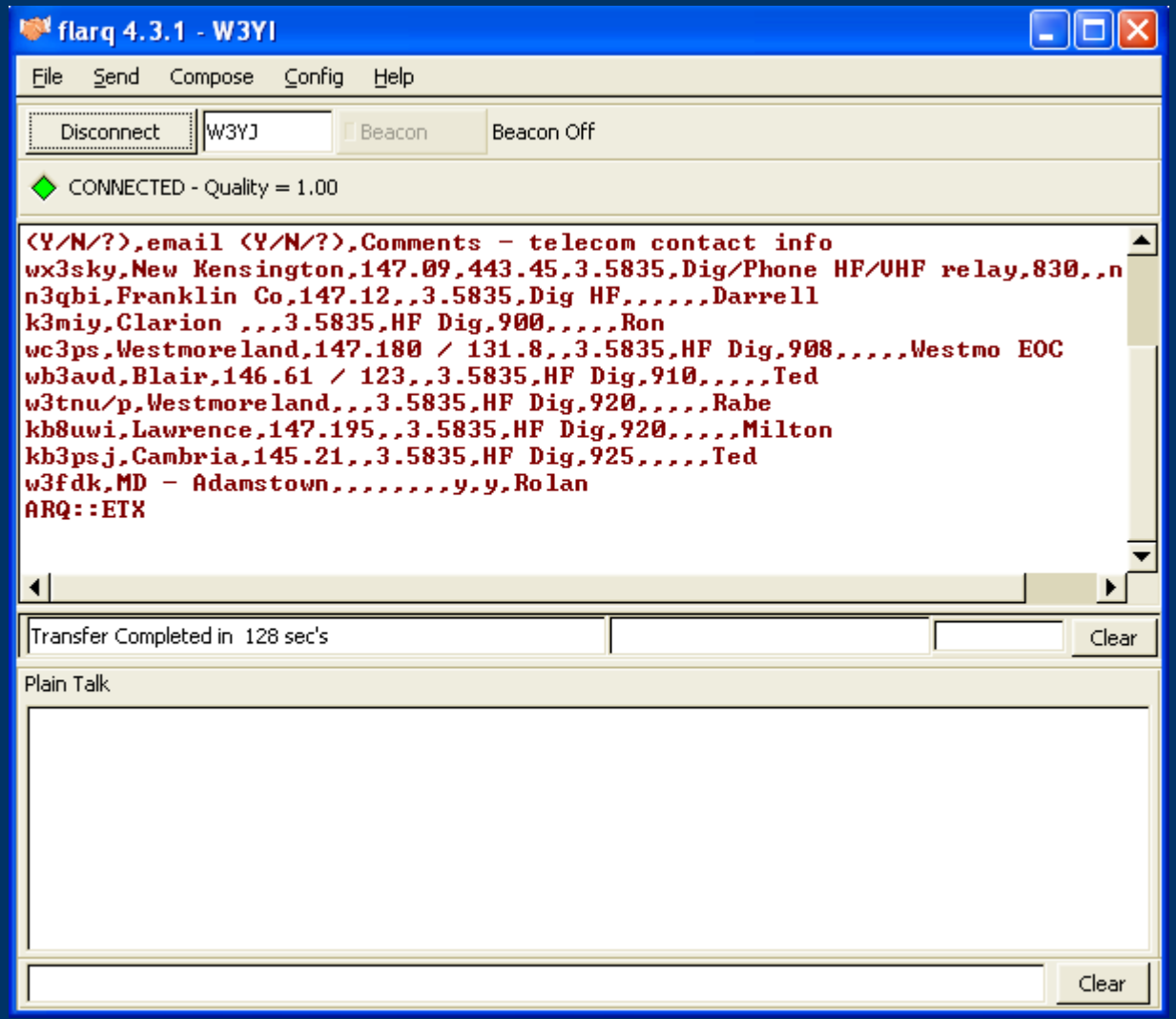
File Transfer – receiver viewpoint



File Transfer complete - sender



File Transfer complete - receiver



Flarq guidelines - pros

- Can transfer very long files
- Possible to change transmit delay to allow courtesy beeps on repeaters
- Great for one-to-one file transfers
- Lots of flexibility with block sizes and different modes

Flarq tradeoffs - cons

- Must have hard-wired interface
- Cannot do broadcasts to many, can only do one-to-one transmissions
- At least 30% performance penalty with largest possible block size
- With small block size, very long transmission times
- Much more complex than flwrap
- MT63 and Olivia do not work with flarq
- ARQ works poorly under noisy conditions

Flarq recommendations

- We think Flarq should be reserved for large file transfers or binary files
- Should be very rare for us to send a binary file
- Use PSK-125R, PSK-250R, and PSK-500R to overcome performance issues
- Train extensively...more difficult to learn than Flwrap
- Be prepared to change modes and block sizes

Benchmarks

- How long to send 2kb and 6kb text bulletin?
- Effect of compression?
- Differences between modes?
- Effect of Flarq block size
- Benchmark files are bulletins with plain text
- Look closely...big surprise is lurking!

Benchmark Results

Mode/Method	2kb Bulletin (sec)	6kb Bulletin (sec)
MT63-2000	115	320
MT63-2000 compressed data	95	215
8/500 Olivia	715	N/A
16/500 Olivia	1070	N/A
PSK 125R	190	615
PSK 125R compressed data	215	520
PSK 250R	95	310
PSK 250R compressed data	110	265
PSK 500R	45	155
PSK 500R compressed data	55	130
PSK 500	25	85
PSK 500 compressed data	30	80
PSK 125R Flarq 256 block	235	710
PSK 125R Flarq 64 block	315	980
PSK 125R Flarq 16 block	652	1970
PSK 500 Flarq 256 block	40	115
PSK 500 Flarq 64 block	60	175
PSK 500 Flarq 16 block	145	440

Benchmarks Discussion

- Compression and PSK don't play well together!
- For 2K file, compressed file takes longer to transfer with PSK modes
- 6K file transfer is not appreciably faster with PSK
- Reason is varicode
- Varicode is optimized for “normal” text
- Example – “e” = 11, “q” = 110111111
- Compressed data no longer has normal distribution of characters

Benchmarks Discussion

- Compression is effective only on large files
- Our 2kb benchmark => 1.68 kb, 16% compressed
- Our 6kb benchmark => 4.09 kb, 31% compressed
- Most of our files will be small because of limited bandwidth
- Big problem: dropping a single bit in a compressed file, everything is lost!
- With plain text, can usually recover something
- May be important depending upon circumstances

Compression Conclusions

- At first glance, compression sounded like a good idea but...
- Doesn't work well with PSK
- Can't compress a small file very much
- Potential to lose entire transmission if single bit is dropped
- Conclusion: Compression not worth the trouble most of the time

Compression use guidelines

- Three simple and easy to remember rules:

  1) Never compress any plain text file
  2) Never compress any file less than 2kb in size
  3) Compress CSV file only if compression is by 50% or more

  - CSV files should compress better because they may be largely numbers
  - Cannot tolerate any error in CSV file, so compression is no drawback.

File Transfer Recommendations

- Rules of thumb for file transfer method for VHF/UHF FM based upon file size...

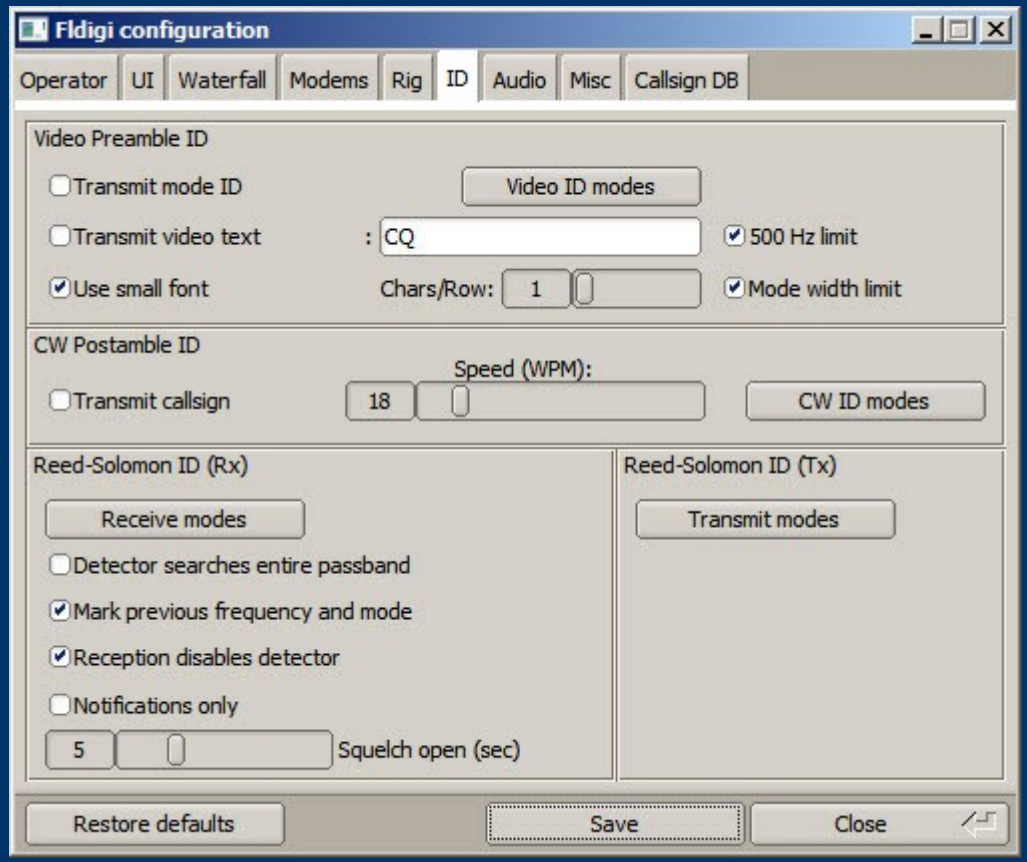
- Up to 2KB, flwrap with MT63
- Consider breaking file into smaller parts if > 2KB
- Consider PSK modes with Flwrap:
  - Large file
  - Hardwired interface
  - Low-noise path
- Greater than 6KB, Flarq with PSK R mode
- Decision is more complex on HF because of band conditions...fading, noise, static, interference.
- That's why we have so many tools available!

RSID

- Reed Solomon id (RSID)
- Tones at begin and end of transmission to help identify mode
- Each mode has a unique RSID
- Fldigi can be configured to automatically change mode upon receiving RSID in passband
- Useful in unattended station for monitoring bulletins
- Set up a scanner, connect to machine with Fldigi, and capture everything!

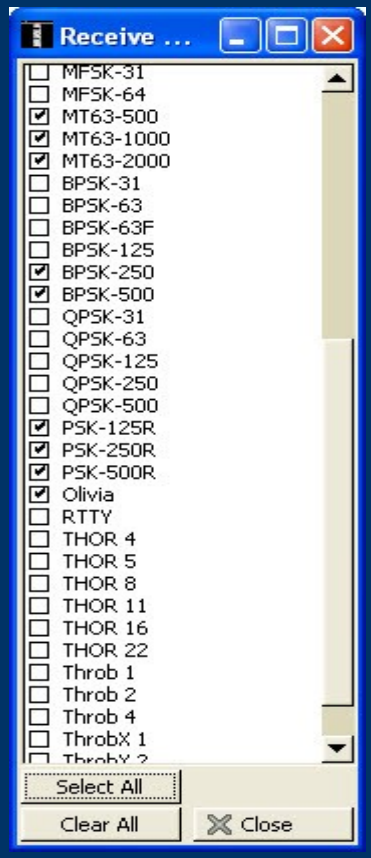
Configuration for RSID

- Go to Configure->IDs menu
- In RSID section, select checkboxes as below



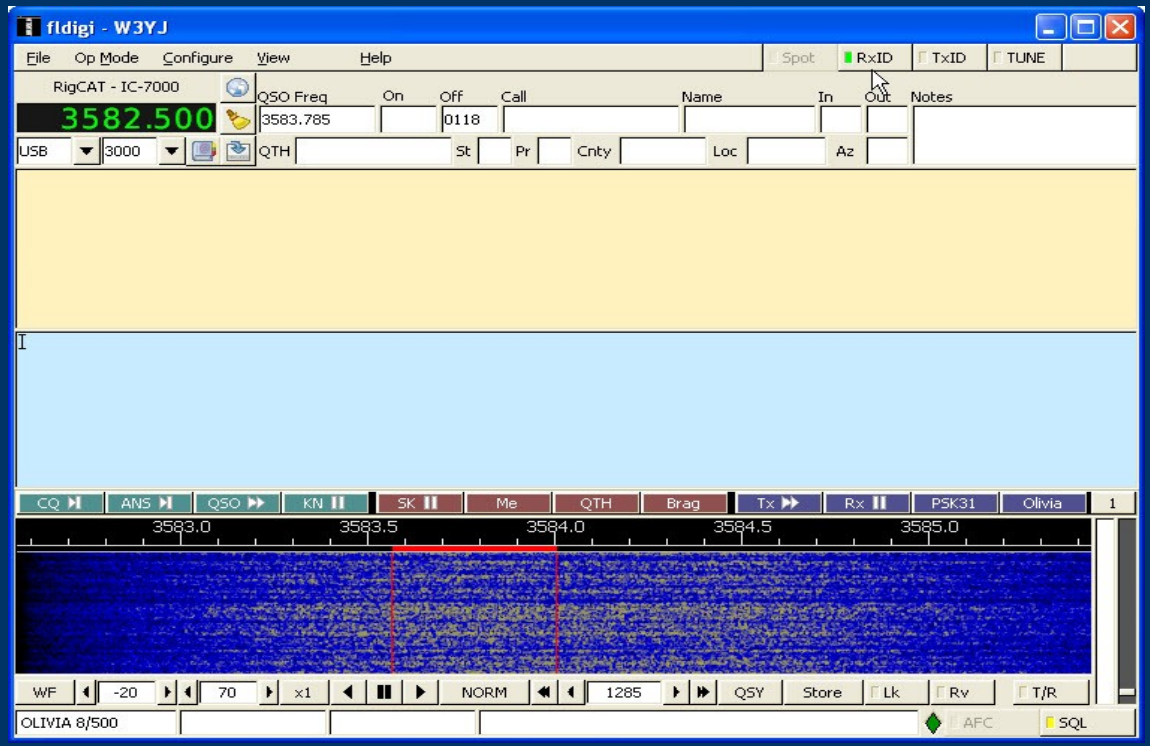
Select RSID modes

- Press Receive Modes button and select modes



Enable use of RSID

- On fldigi screen, push RSID control
- Fldigi will automatically change mode when RSID tone is recognized!



What's next?

- Get on the air and make some noise!
- Join http://paNBEMS.org
- NBEMS is not hard to master, but does require practice
- So...start organizing practice nets on HF and VHF/UFH

Acknowledgments

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- NA0B, Dr. Juan Manfredi, University of Pittsburgh
- KB3JXG, James Farringer, Superintendent of Police, O'Hara Twp, PA

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- N3LLR, Bill Edgar, Atlantic Division Director
- N3MSE, John Rodgers, Western PA SM
- AB3ER, Larry Keller, Western PA SEC
- N3SPW, John Szwarc, former Western PA SEC