

# *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: 1.1.1AG filename: W3YJ-20101125-232207Z-1.21

File Template Config Help

ICS Radiogram Generic Blank DnD

203 205 206 213 214 216

Originator Responder

To Dave Kleber KB3FXI Pos. O'Hara Twp EMA

Fm Harry Bloomberg W3YJ Pos. Assistant SEC

Sub. Activation Required?

Date 2010-11-25 Time 2321Z

Message:

What is the situation in O'Hara Township? Does Western PA ARES need to activate?

Sig. Harry Bloomberg W3YJ Pos. Assistant SEC

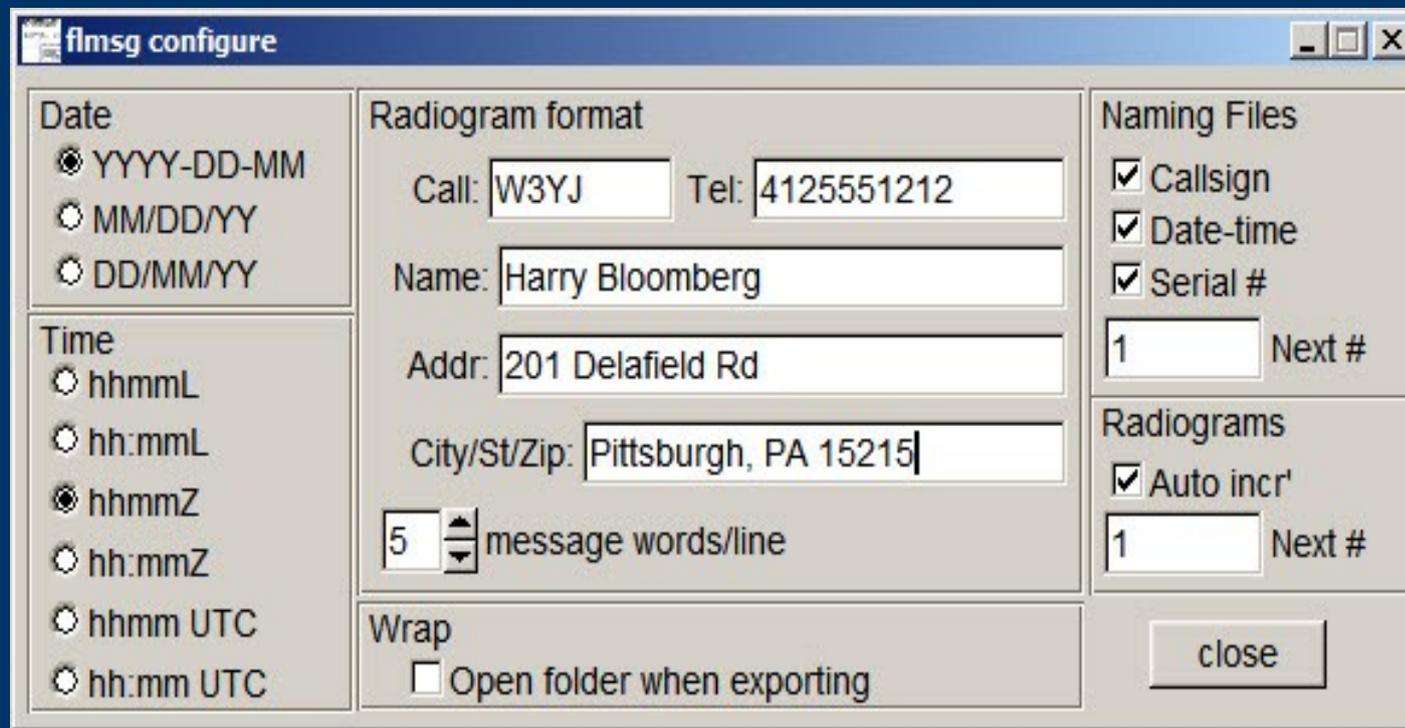
# Flmsg ARRL Radiogram screen

The screenshot shows the FLMSG: 1.1.1AG application window. The title bar reads "FLMSG: 1.1.1AG" and the filename is "default.m2s". The menu bar includes "File", "Template", "Config", and "Help". Below the menu bar are tabs for "ICS", "Radiogram", "Generic", "Blank", and "DnD". The "Message" and "Records" tabs are also visible. The main form contains the following fields and controls:

- SVC**: A checkbox.
- \*NR**: A text input field.
- \*PREC**: A dropdown menu currently set to "ROUTINE".
- HX**: A text input field.
- \*STN ORIG**: A text input field.
- CK**: A text input field with a "ck" button next to it.
- PLACE OF ORIG**: A text input field.
- TIME FILED**: A text input field with a "..." button.
- \*MON DY**: A text input field with a "..." button.
- \*TO**: A large text input area.
- TEL:**: A text input field.
- OP NOTE:**: A text input field.
- ARL MSG**: A button.
- TXT:**: A large text input area.
- SIG:**: A text input field.
- OP NOTE:**: A text input field.

# Flmsg - configuration

- Click on Config menu
- Enter your preferences and info



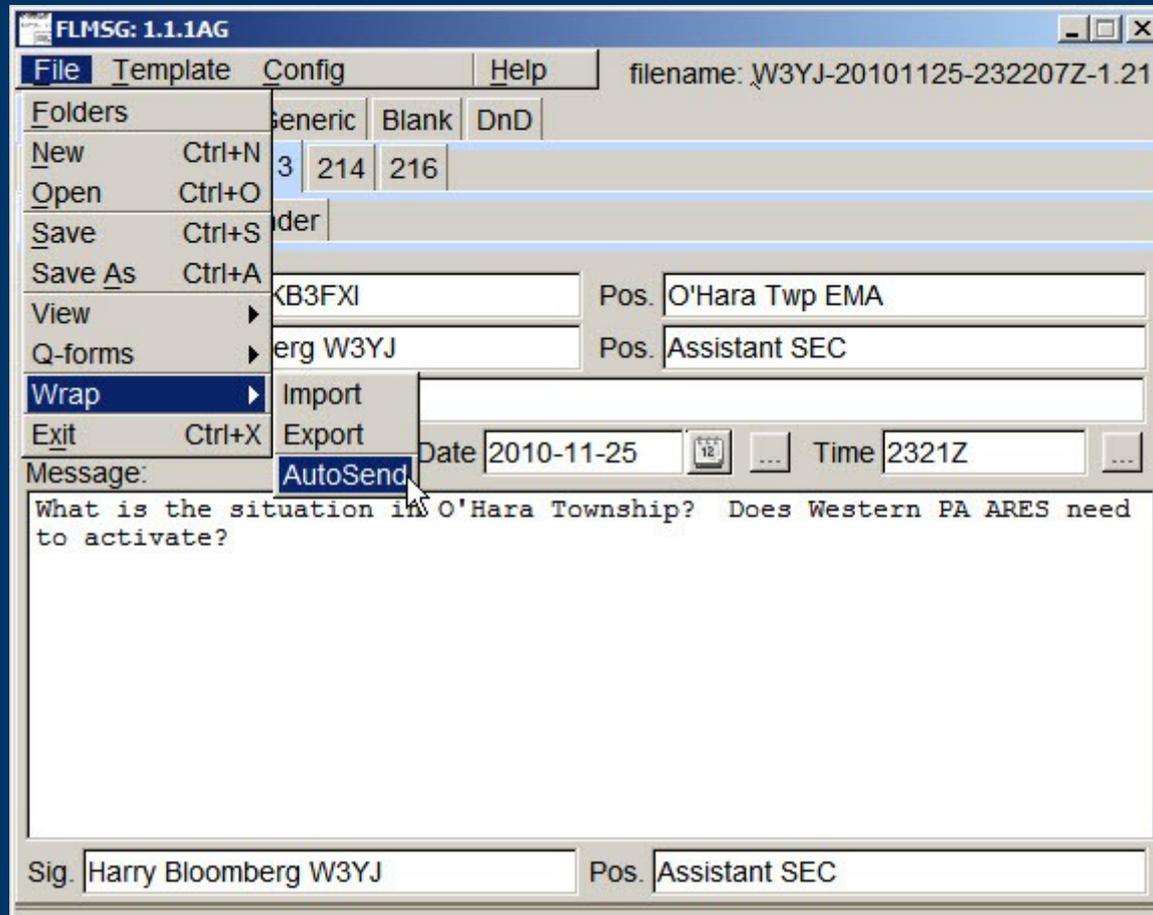
The screenshot shows a Windows-style dialog box titled "flmsg configure". It is divided into several sections:

- Date:** Three radio buttons for date formats:  YYYY-DD-MM,  MM/DD/YY, and  DD/MM/YY.
- Time:** Six radio buttons for time formats:  hhmmL,  hh:mmL,  hhmmZ,  hh:mmZ,  hhmm UTC, and  hh:mm UTC.
- Radiogram format:** Fields for "Call:" (W3YJ), "Tel:" (4125551212), "Name:" (Harry Bloomberg), "Addr:" (201 Delafield Rd), and "City/St/Zip:" (Pittsburgh, PA 15215). A spinner box shows "5" with "message words/line" next to it.
- Naming Files:** Three checked checkboxes: "Callsign", "Date-time", and "Serial #". Below them is a spinner box with "1" and "Next #".
- Radiograms:** One checked checkbox: "Auto incr'". Below it is a spinner box with "1" and "Next #".
- Wrap:** A checkbox labeled "Open folder when exporting" which is currently unchecked.
- A "close" button is located at the bottom right.

# *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!

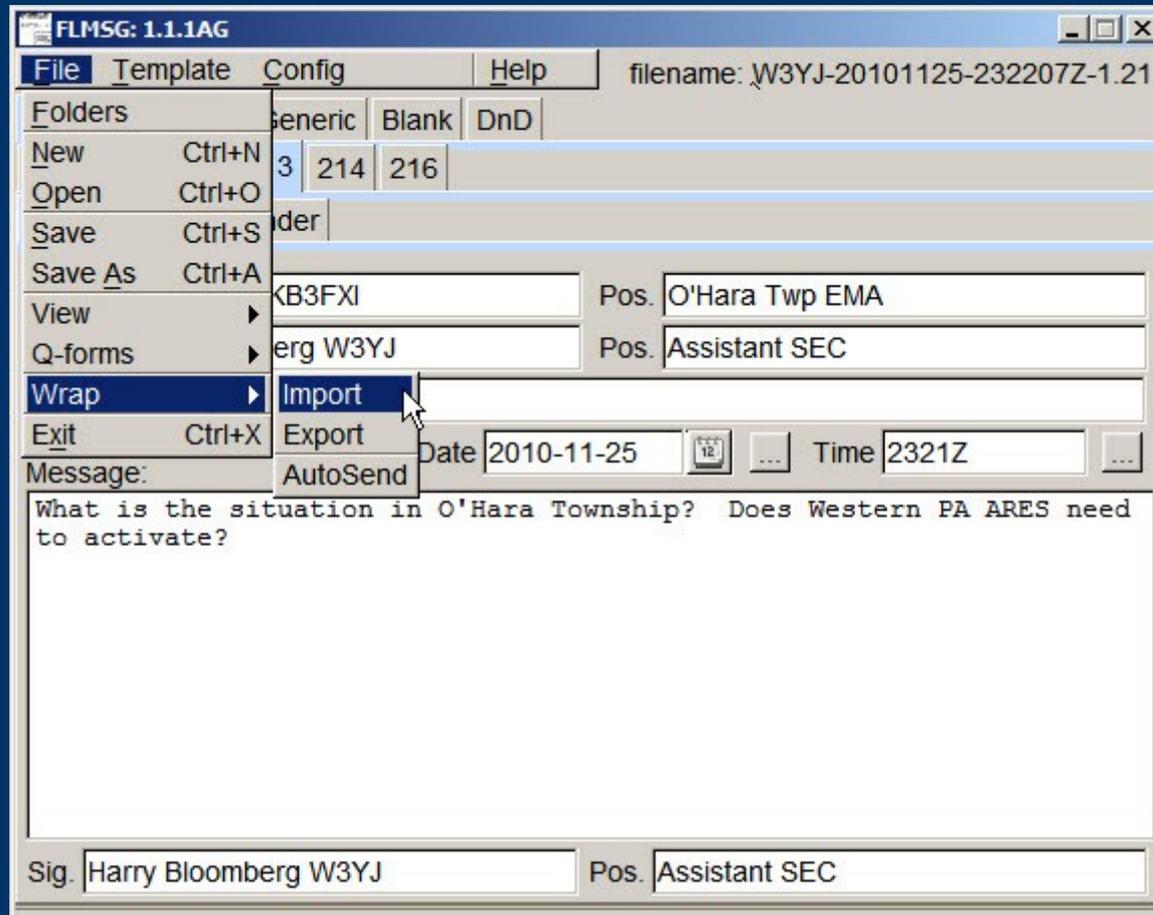
# Auto sending ICS-213



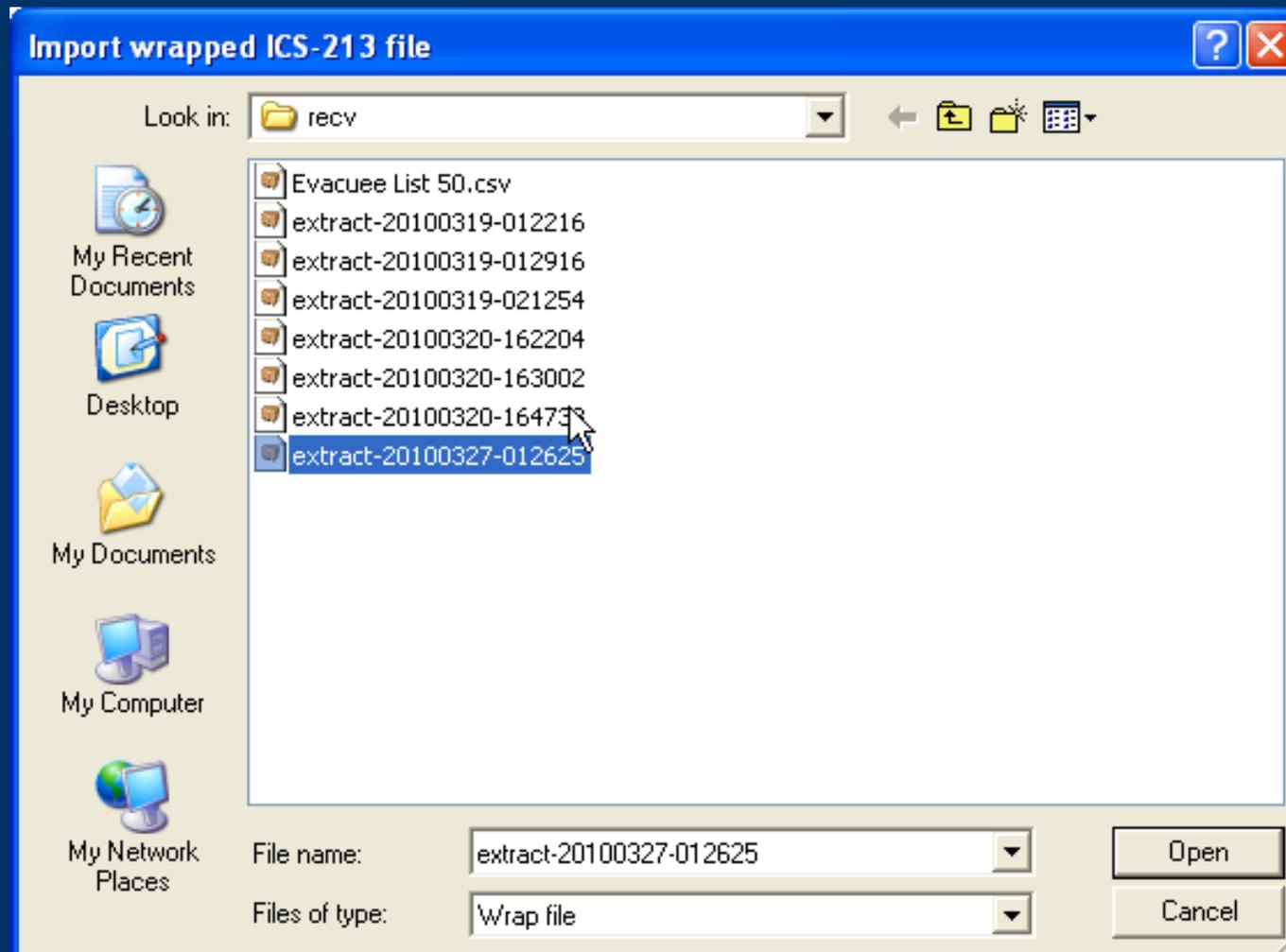
# Receiving ICS-213

- 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

The screenshot shows the FLMSG: 1.1.1AG application window. The title bar reads "FLMSG: 1.1.1AG" and the filename is "W3YJ-20101125-232207Z-1.21". The menu bar includes "File", "Template", "Config", and "Help". The "Template" menu is open, showing options: "Load", "Generic", "Blank", "DnD", "Save", "213", "214", "216", and "Save As". The "Save As" option is highlighted. Below the menu, there are fields for "Originator" and "Responder". The message header fields are: "To: O'Hara Township EOC", "Fm: Shelter", and "Sub: Shelter Report". There are "Pos." fields for both "To" and "Fm". The "Message:" section has "Date" and "Time" fields with calendar and clock icons. The message body contains the following text: "Current Shelter Status Report", "Date/time in UTC:", "Name of shelter:", "Location of shelter:", "Number of evacuees:", "Available beds:", and "Notes:". At the bottom, there are "Sig." and "Pos." fields.

# 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



# *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: 1.1.1AG

File Template Config Help filename: default.m2s

ICS Radiogram Generic Blank DnD

Message Records

SVC  \*NR 1 \*PREC ROUTINE HX HXG hx \*STN ORIG W3YJ CK ARL 10 ck

PLACE OF ORIG PITTSBURGH PA TIME FILED 2350Z \*MON DY NOV 25

\*TO DAVE KLEBER KB3FXI TEL: 4125551212

OP NOTE:

ARL MSG

TXT:

ARL ONE X DO YOU  
NEED ASSISTANCE QUERY PLEASE ADVISE  
THIS CAUSES CK TO GO RED

SIG: HARRY BLOOMBERG W3YJ OP NOTE:

# Flmsg – Handling Instructions Tool

The screenshot shows the FLMSG: 1.1.1AG software interface. The main window has a menu bar (File, Template, Config, Help) and a toolbar (ICS, Radiogram, Generic, Blank, DnD). The 'Message' tab is active, showing a form with fields for SVC, \*NR, \*PREC, HX, \*STN ORIG, and CK. The 'HX' field is open, showing a list of options: HXA, HXB, HXC, HXD, HXE, HXF, and HXG. The 'HXG' option is selected, and a 'Handling' dialog box is open, displaying the text: 'Delivery by mail or landline toll call not required. If toll call or other expenses involved, cancel message and send service message back to originating station.' The 'Handling' dialog box has 'Cancel' and 'OK' buttons. The main form also has a 'ck' button. The 'TXT:' field contains the text: 'ARL ONE X DO YOU NEED ASSISTANCE QUERY PL THIS CAUSES CK TO GO RED'. The 'SIG:' field contains 'HARRY BLOOMBERG W3YJ' and the 'OP NOTE:' field is empty.

SVC	*NR	*PREC	HX	*STN ORIG	CK
<input type="checkbox"/>	1	ROUTINE	HXG	W3YJ	ARL 10

PLACE OF ORIG: PITTSBURGH PA

\*TO: DAVE KLEBER KB3FXI

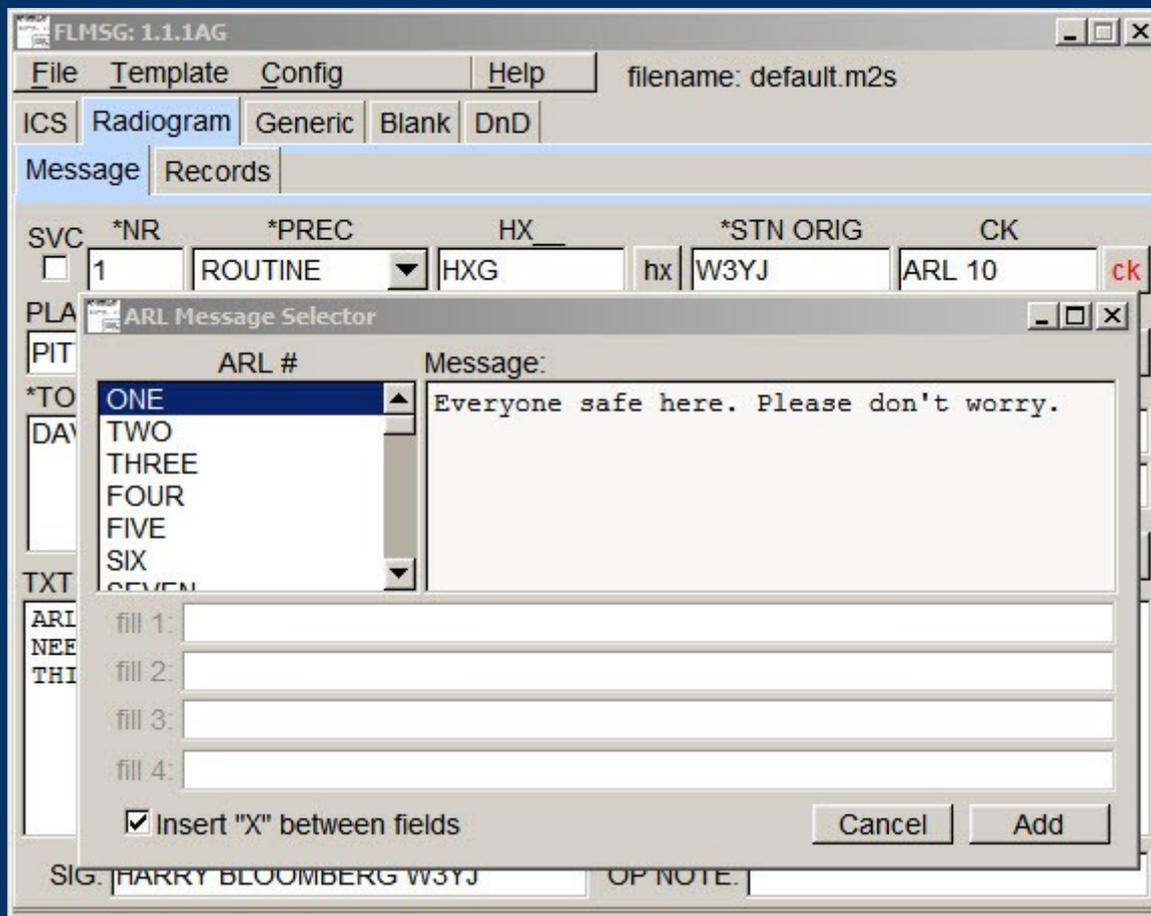
TXT: ARL ONE X DO YOU  
NEED ASSISTANCE QUERY PL  
THIS CAUSES CK TO GO RED

SIG: HARRY BLOOMBERG W3YJ

OP NOTE:

Handling dialog box text:  
Delivery by mail or landline toll call not required  
If toll call or other expenses involved, cancel  
message and send service message back to  
originating station.

# 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

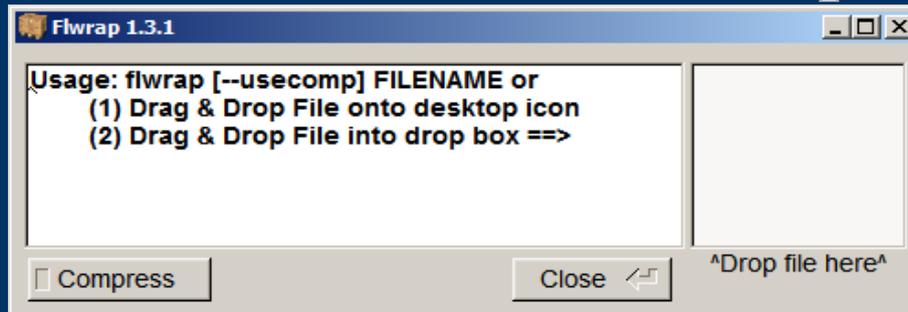
- PSK-500R is faster than MT63, PSK-250R as fast
- Why do we continue to use MT63?
  - MT63 tolerates tuning errors
  - MT63 audio levels can vary widely
  - MT63 works well with acoustical coupling
  - MT63-2000 audio offset fixed at 1500 Hz, not possible to change by accident
- MT63 is much more robust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

# *Data compression with flwrap*

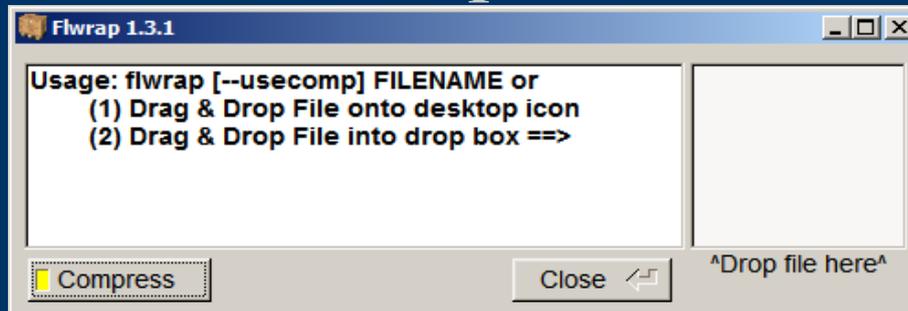
- Flwrap can compute a file checksum and encapsulate file with [wrap] identifiers.
- Can also compress files!
- Much easier to compress files with updated version.

# 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 successful receipt of block
- Continues until file transfer is complete

# Using Flarq

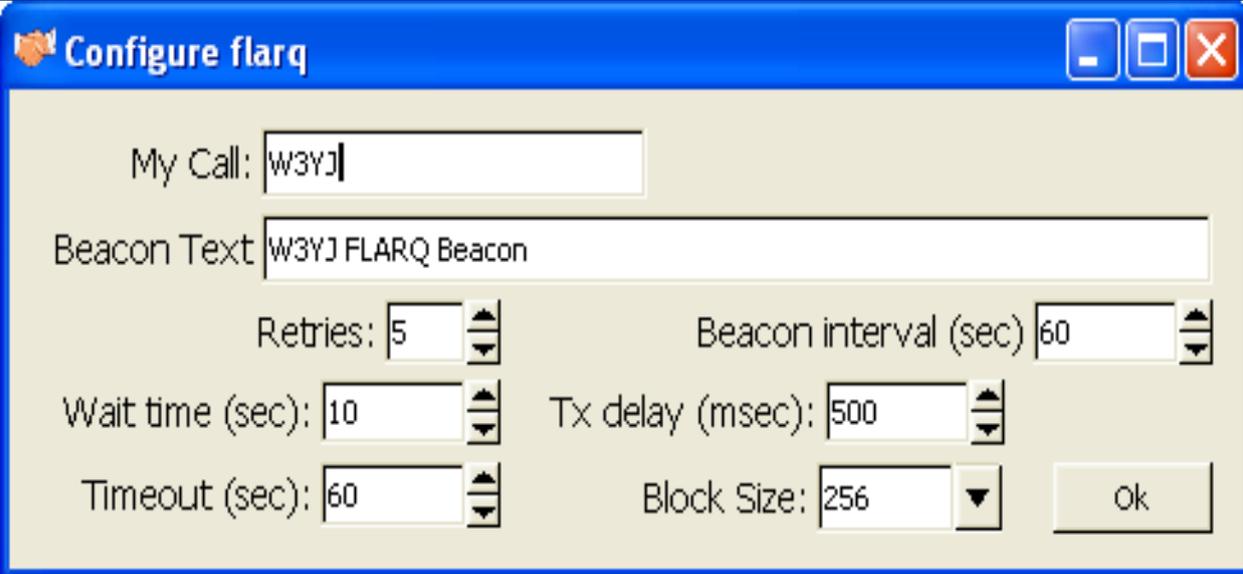
- Two stations establish a connection
- Station A transmits a beacon
- Station B responds to the beacon
- A and B establish a connection
- Either station starts a file transfer
- File transfer either continues successfully to completion or fails
- Another file can then be transferred, or connection broken

# *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



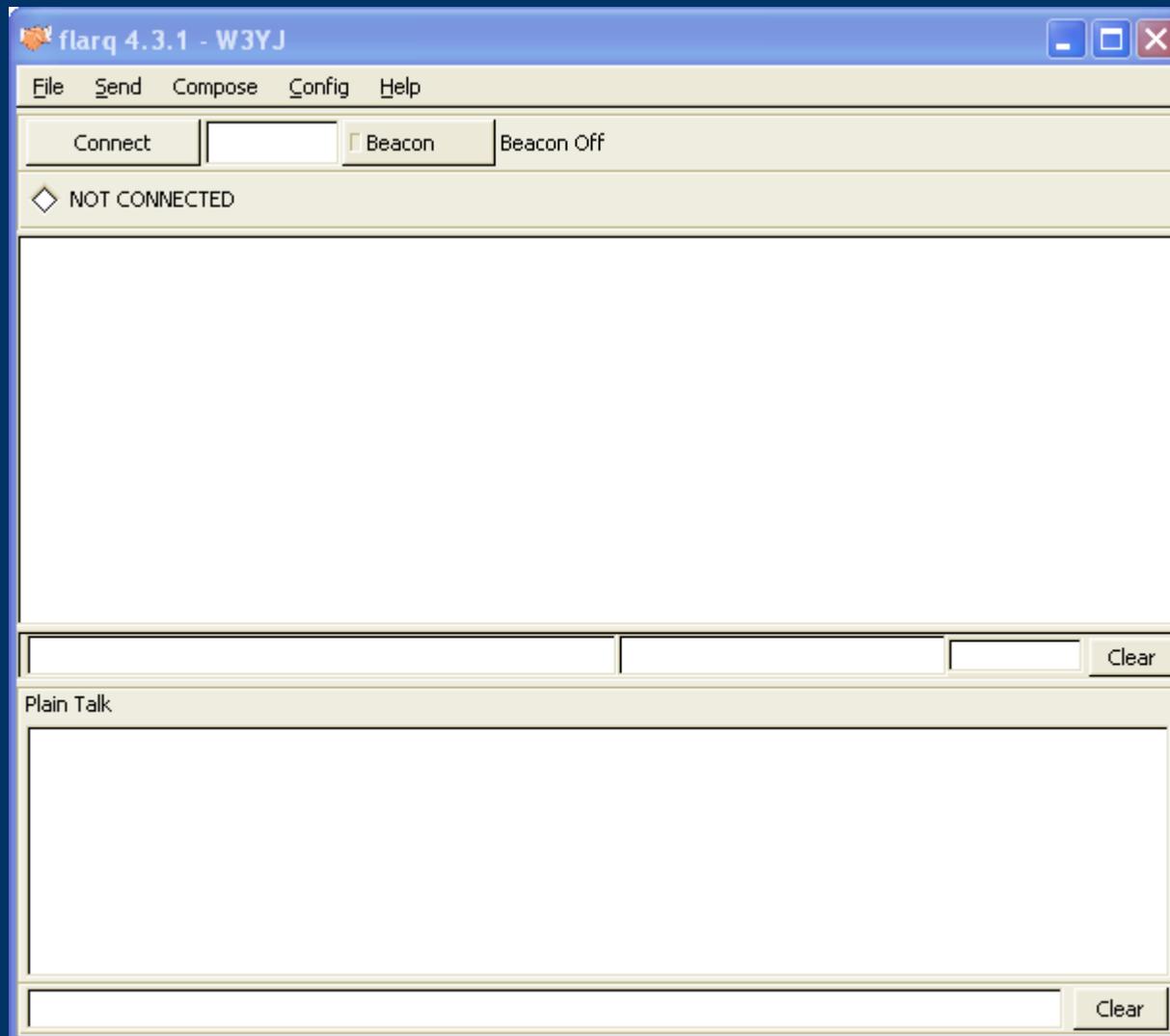
The screenshot shows a Windows-style dialog box titled "Configure flarq". It contains several input fields and spinners for configuring beacon parameters:

- My Call:** A text box containing "W3YJ".
- Beacon Text:** A text box containing "W3YJ FLARQ Beacon".
- Retries:** A spinner box set to "5".
- Beacon interval (sec):** A spinner box set to "60".
- Wait time (sec):** A spinner box set to "10".
- Tx delay (msec):** A spinner box set to "500".
- Timeout (sec):** A spinner box set to "60".
- Block Size:** A dropdown menu set to "256".
- Ok:** A button to confirm the configuration.

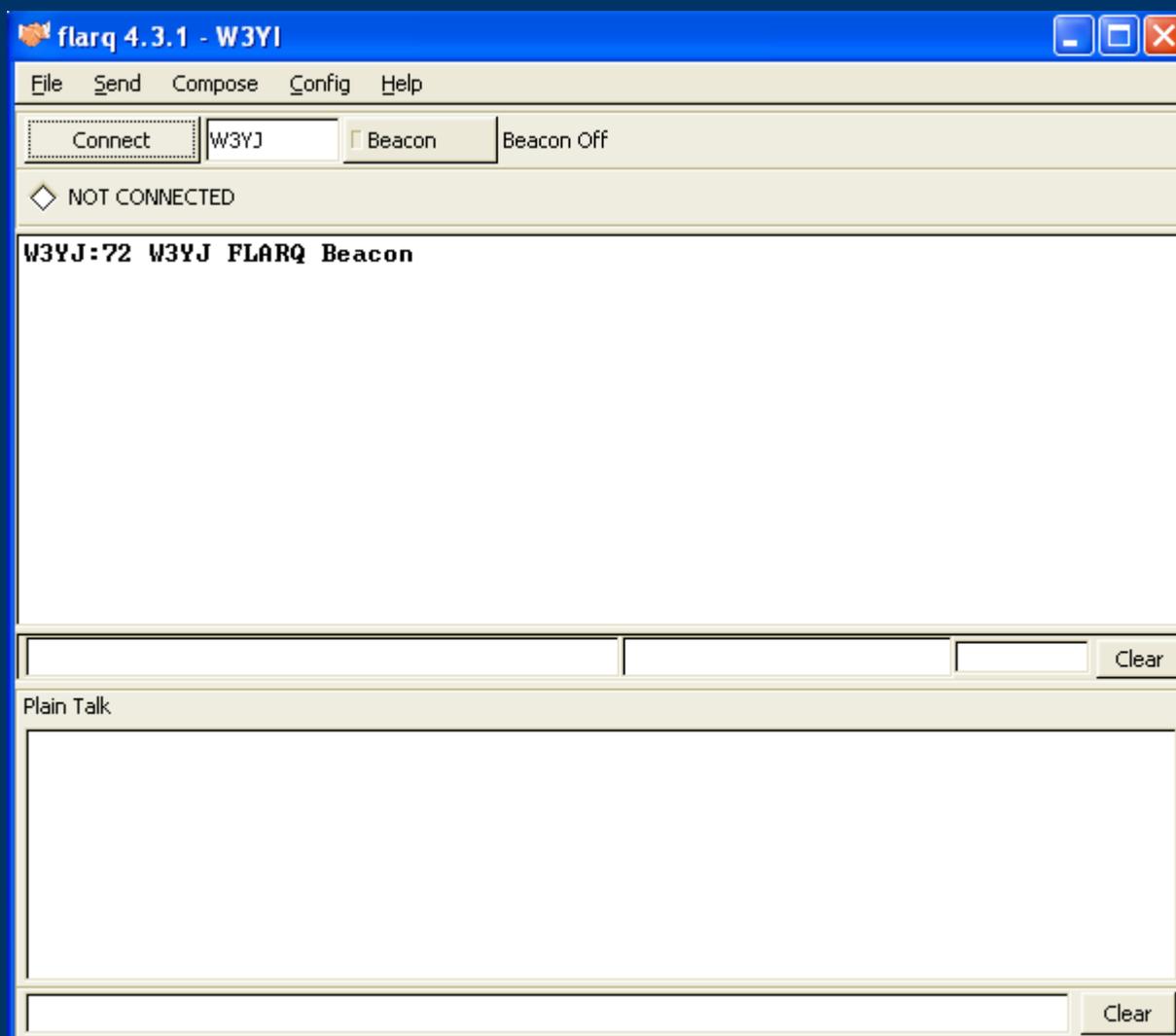
# *Example of Flarq in use*

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

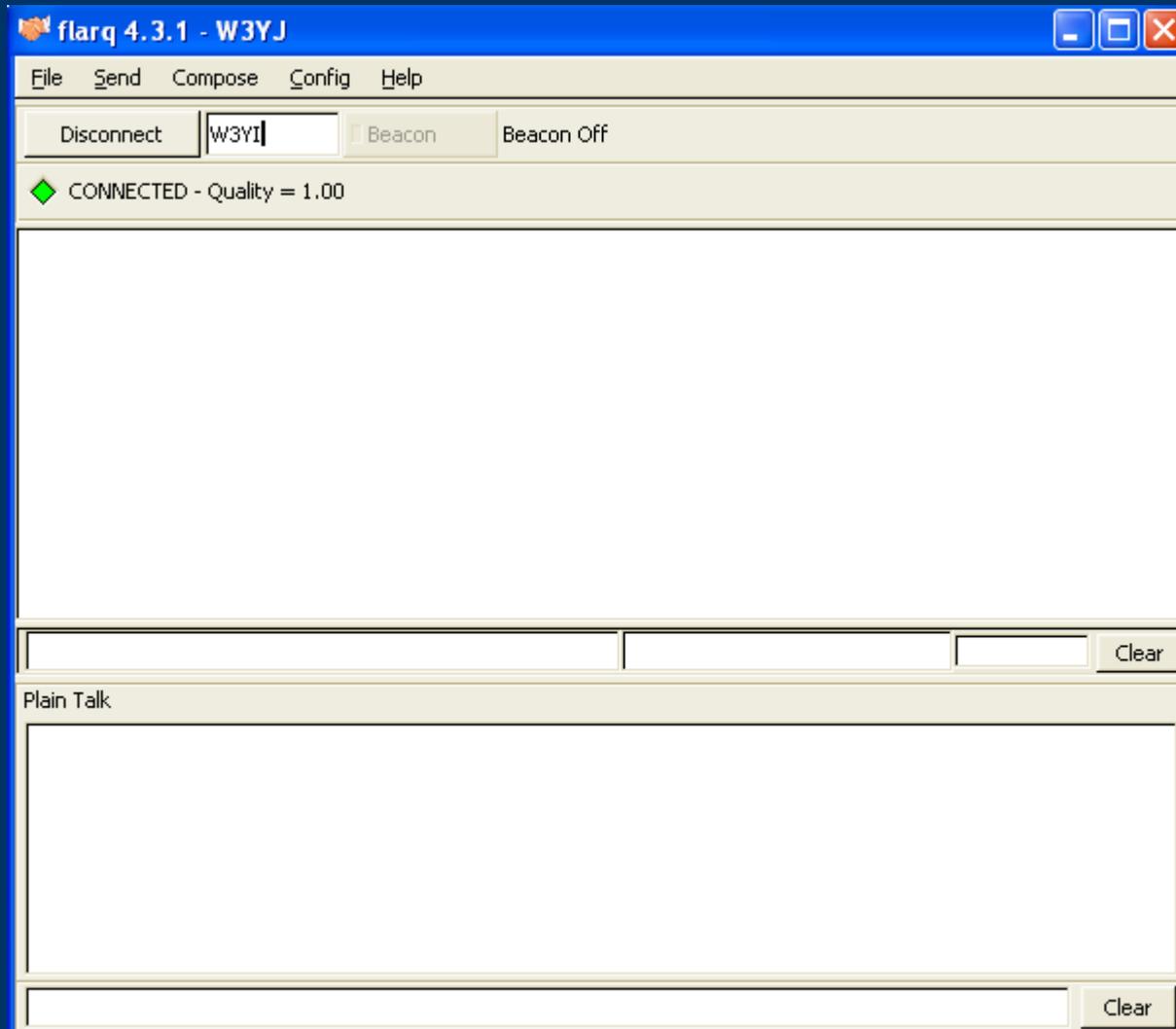
# Start Beacon - W3YJ



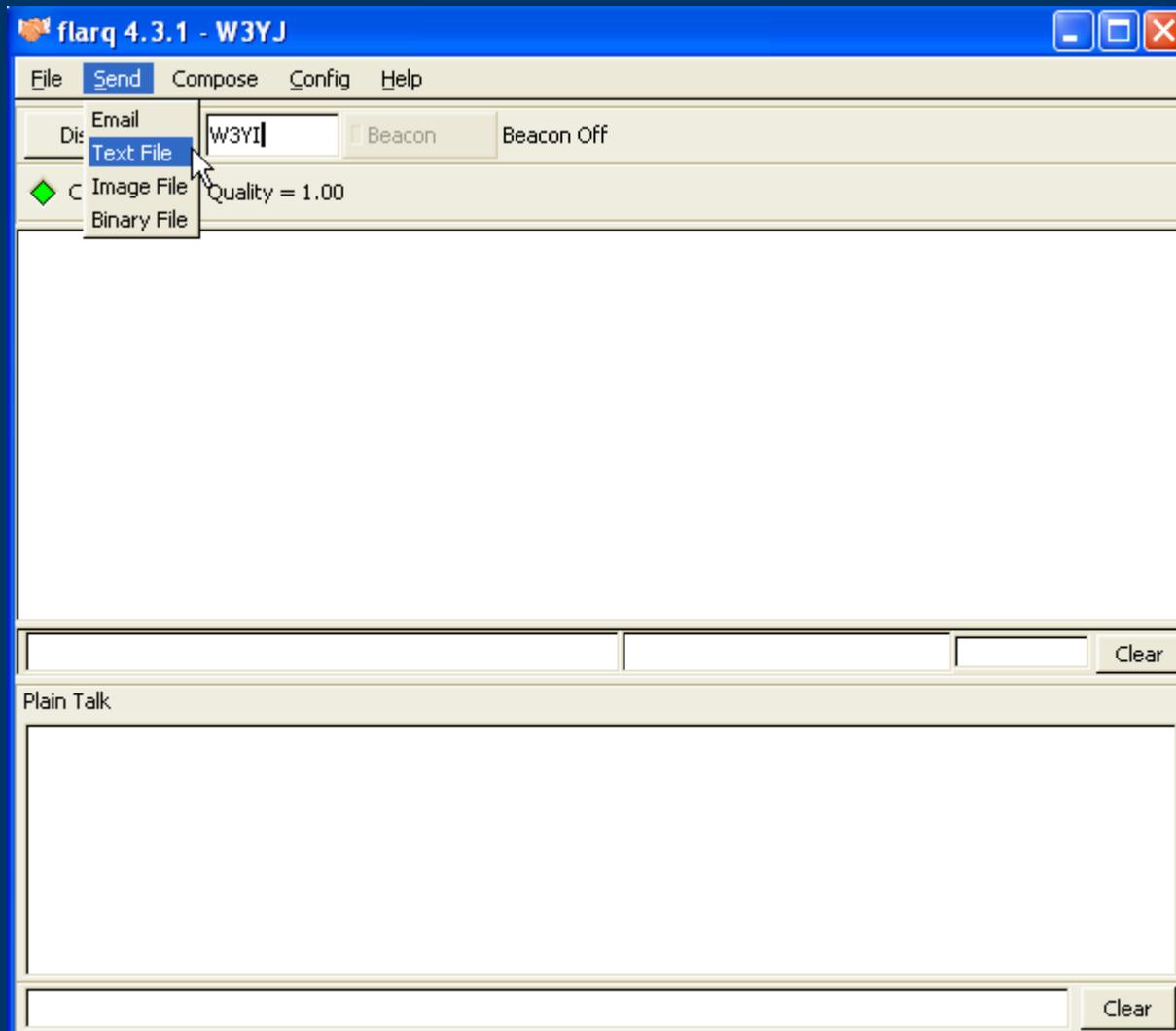
# *Respond to beacon - W3YI*



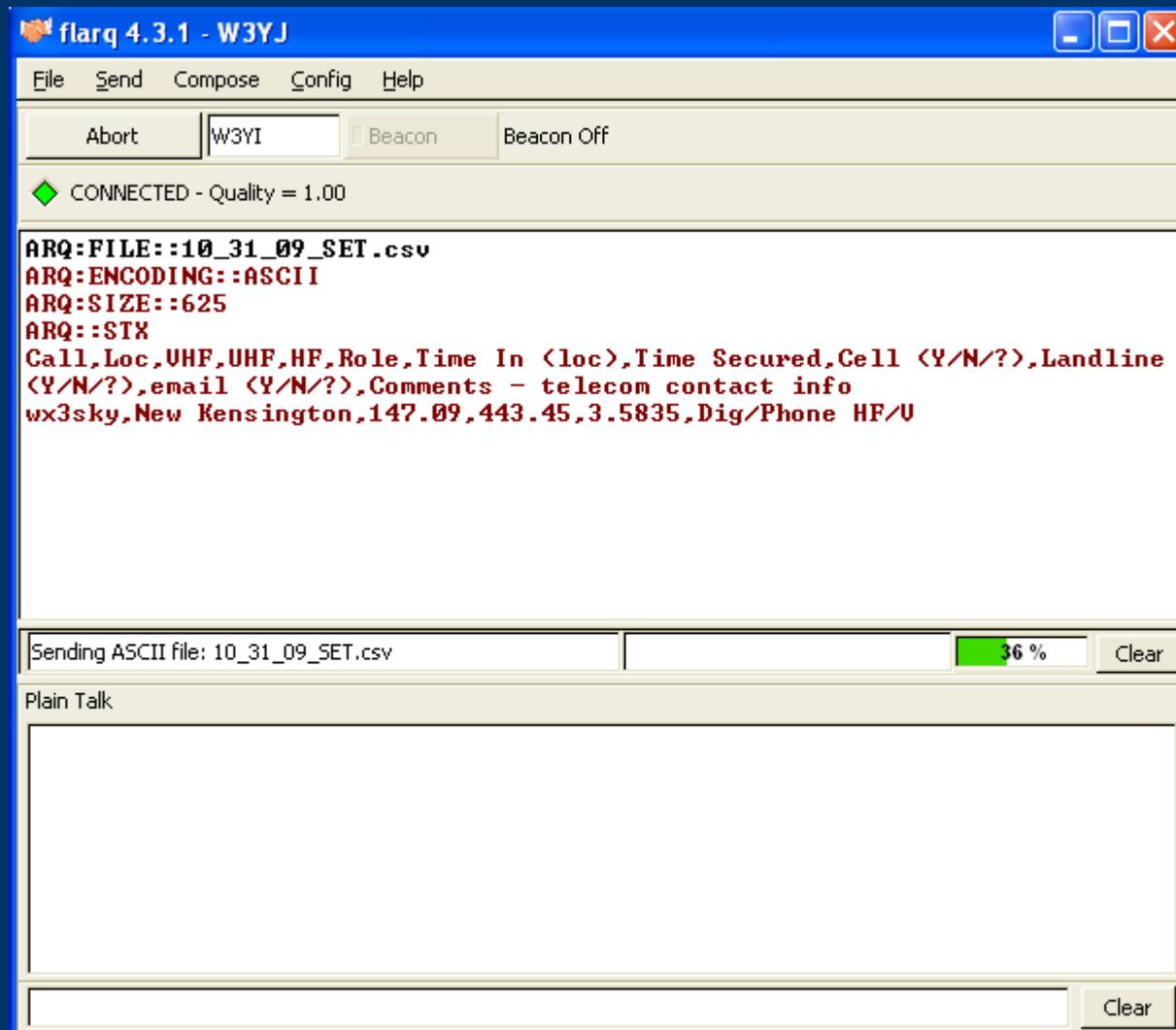
# *Wait for connection*



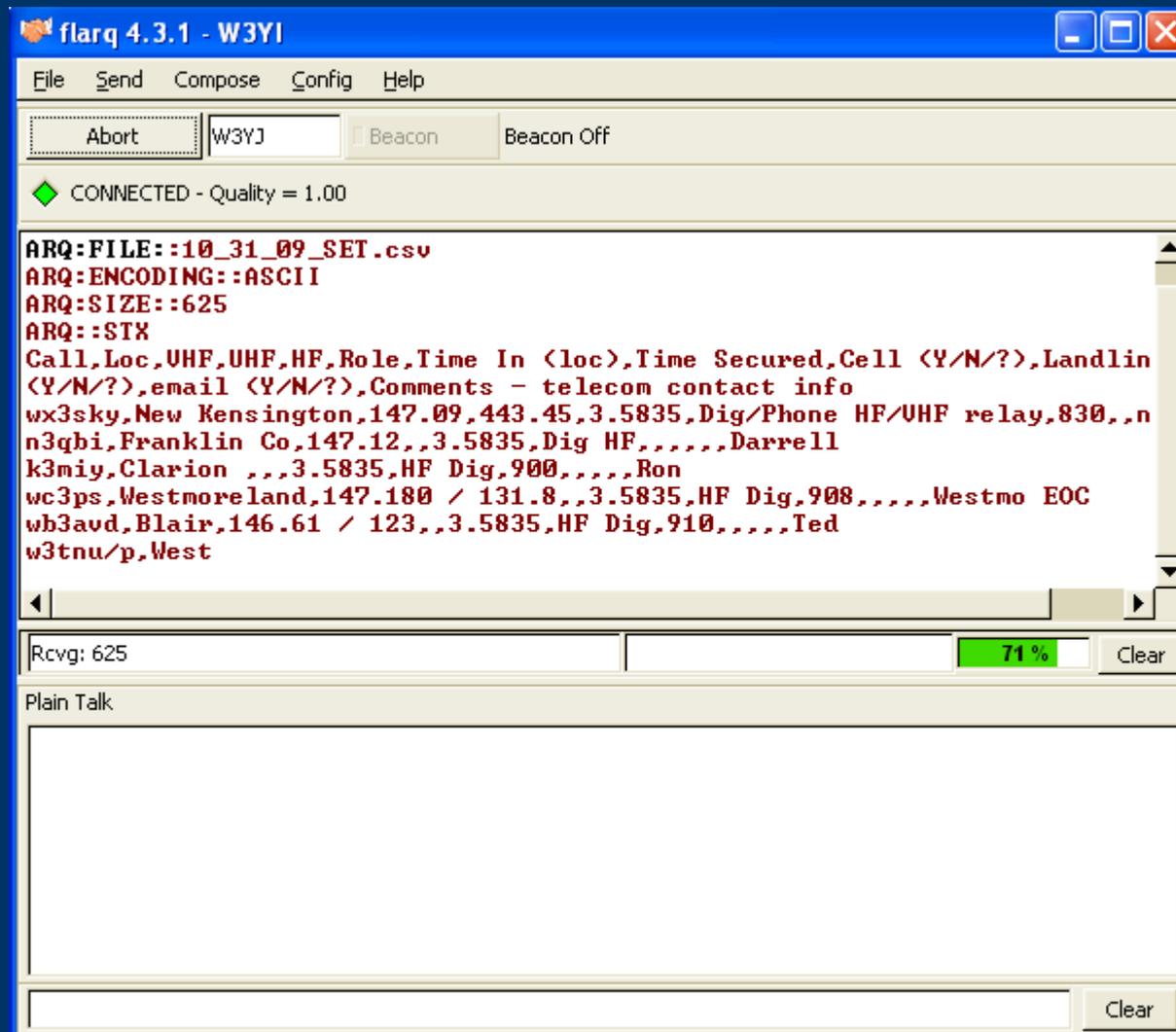
# Initiate file transfer – W3YJ sender



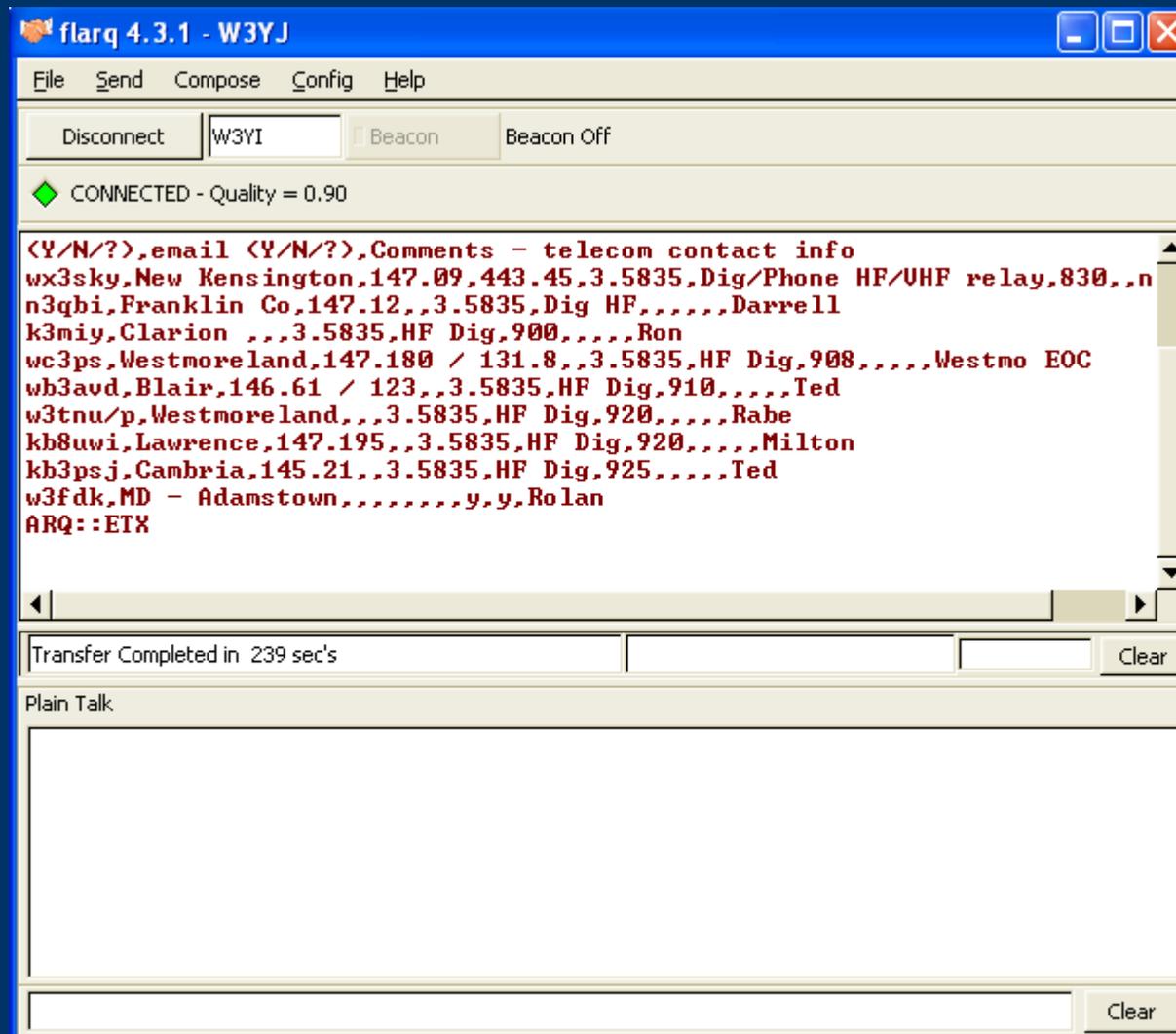
# File Transfer – sender viewpoint



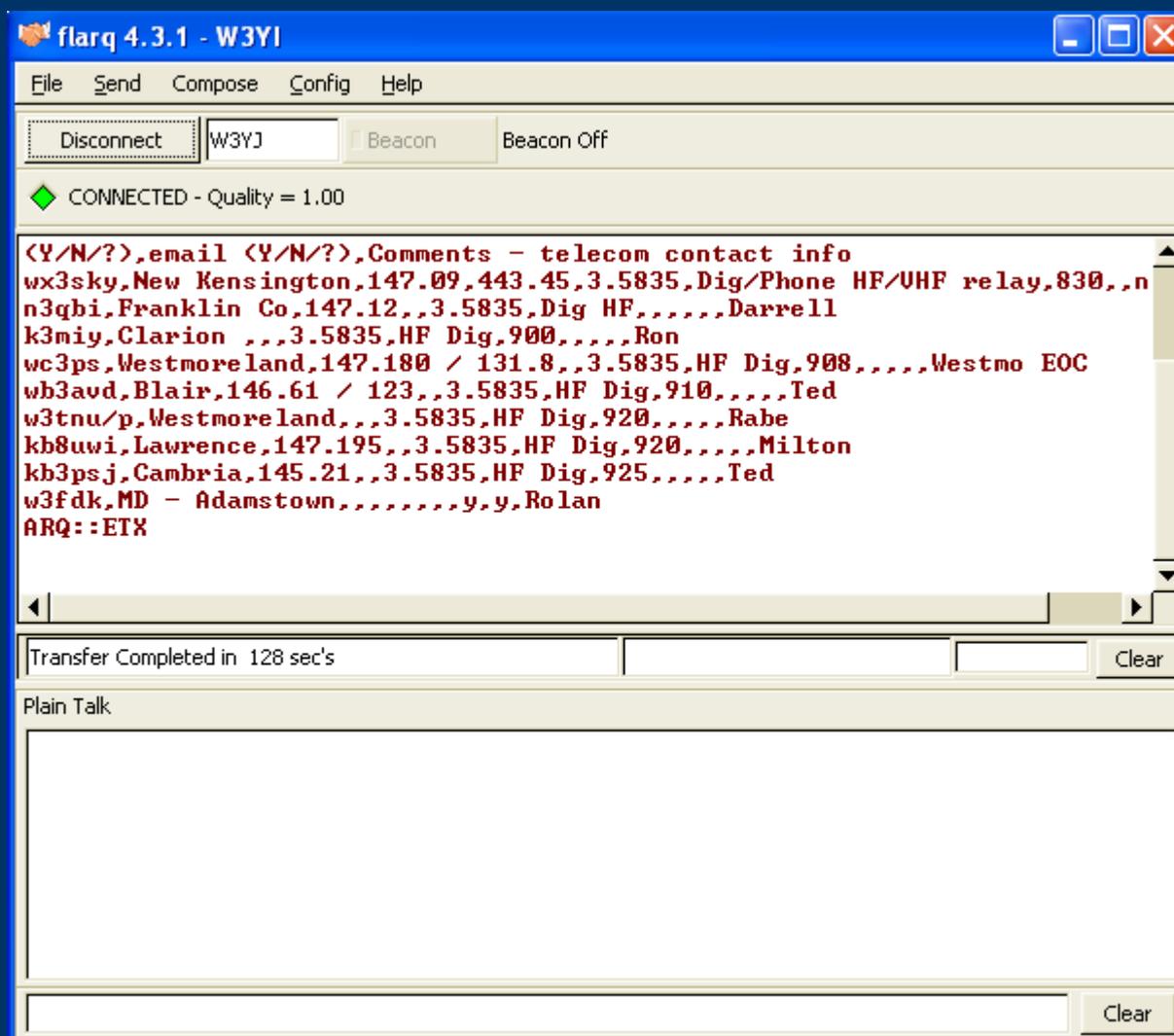
# File Transfer – receiver viewpoint



# 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*

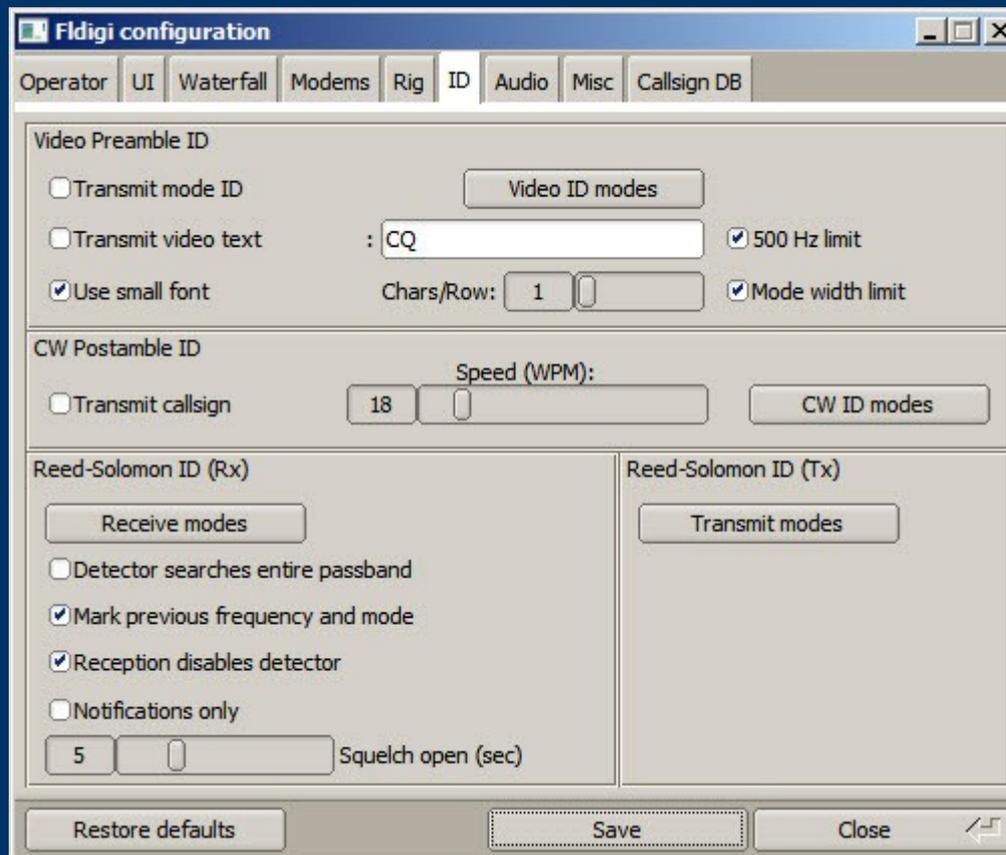
- Rules of thumb for file transfer method for VHF/UHF FM based upon file size...
- Up to 2KB, flwrap with MT63
- Consider breaking file into smaller parts if  $> 2\text{KB}$
- Consider PSK modes with Flwrap:
  - Large file
  - Hardwired interface
  - Low-noise path
- Greater than 6KB, Flarq with PSK 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!

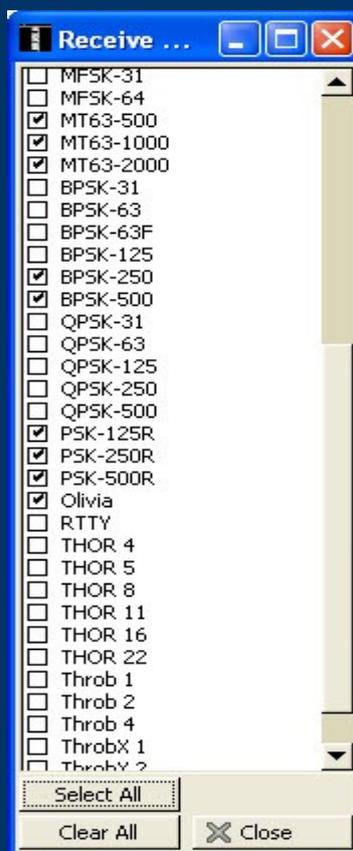
# Configuration for RSID

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



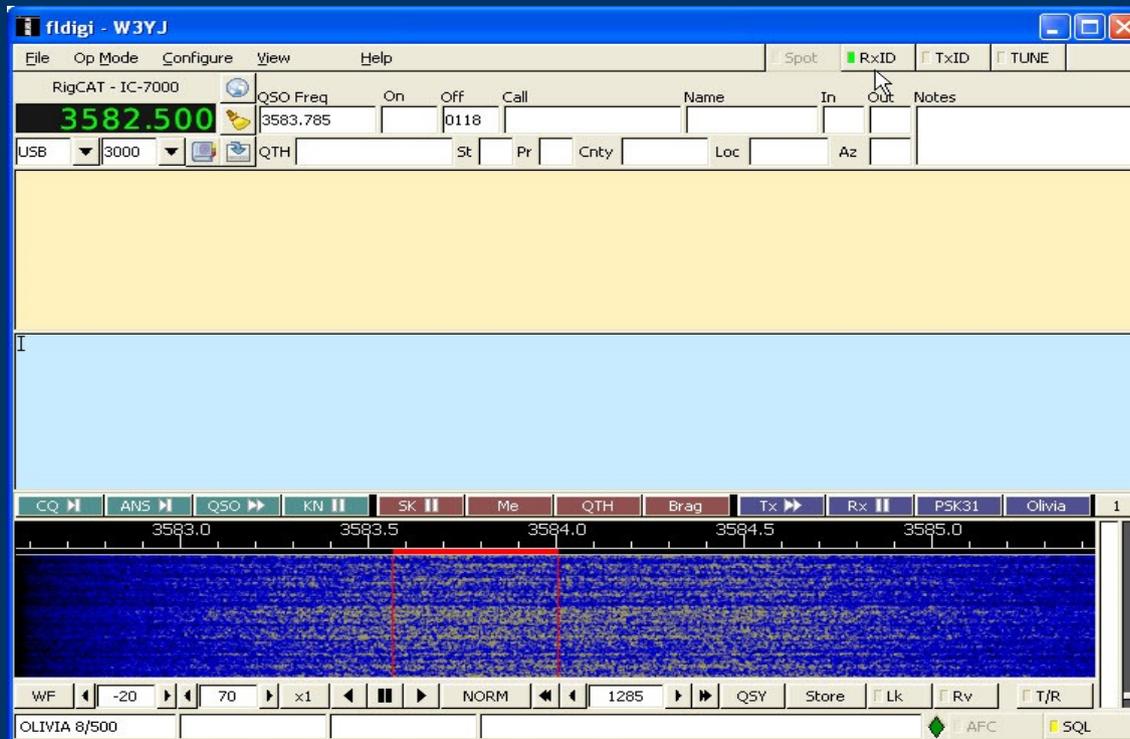
# Select RSID modes

- 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

We'd like to thank the following:

- W1HKJ, Dave Freese, lead NBEMS developer
- KH6TY, Howard Teller, NBEMS developer
- W3HRK (sk), Dr. G. Alec Stewart, University of Pittsburgh
- NA0B, Dr. Juan Manfredi, University of Pittsburgh
- KB3JXG, James Farringer, Superintendent of Police, O'Hara Twp, PA

Current and former ARRL Leadership:

- 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