

# All Things Digital

Amateur Radio for the 21<sup>st</sup> Century

Robert C. Mazur, VA3ROM

E: [va3rom@gmail.com](mailto:va3rom@gmail.com)

W: <http://www.va3rom.com>



## JS8 Calling – Part 2

**Note:** This is a continuation of my “JS8 Calling” column and a simulation is used as an example. “JS8 Calling – Part 1” is provided in the May-June 2019 TCA.

### Introduction

JS8Call, like many other Amateur Radio data modes, is primarily used for casual contacts and conversations (QSOs), while Internet and cellular systems have become the main 24/7 traffic thoroughfare for everything else (voice and data). But what do you do when some or all connections to/from cyberspace are limited or severed, and you need to establish an emergency communications (EmComm) network and provide a radio service in to or out of a disaster area (simulated or real)? Don’t think “it will never happen here” because “If you fail to plan, you plan to fail”. A Carrington Event solar “super-storm” striking Earth head-on could easily take out interconnected power and telecommunication grids around the world for days, weeks or even longer!

### A Network by any Other Name

It takes two to form a network or group (the JS8Call term). Networks and groups are basically the same and they can be either public (open to all) or private (members only). A JS8Call group makes it very easy for an emergency operation centre (EOC) to send an “All Stations” (general

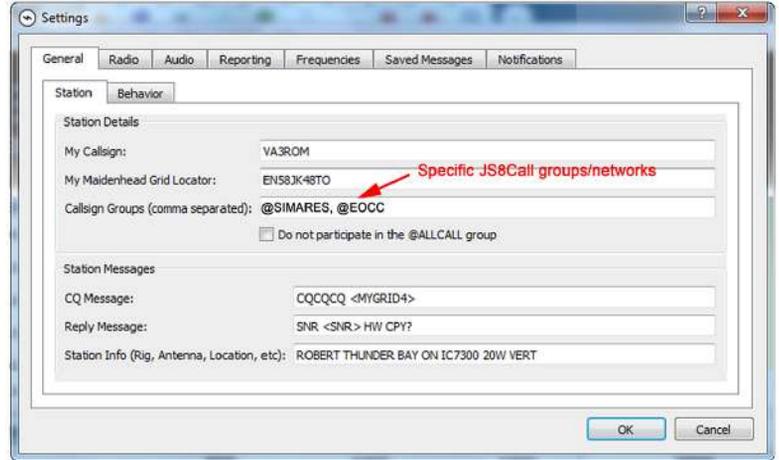


Figure 1A: Creating an @Group – Example 1

broadcast) to other Amateur Radio Emergency Service (ARES) members, or to store/forward or relay messages (traffic) to/from specific EOCs and/or ARES members, and vice versa. But if you aren’t a member of a specific group, your JS8Call program will not print text to screen as it ignores any transmissions received to/from that group, which provides privacy and message confidentiality.

**Note:** A JS8Call group begins with a comma or “at” (@) character and can include up to eight additional alphanumeric combinations of characters using A to Z and 0 to 9 (see Figures 1A and 1B).

As with its basic automatic packet radio reporting system (APRS) and short message service (SMS) features (see Part 1 of this column in the May-June 2019 TCA), JS8Call’s packet radio capabilities are still very rudimentary and aren’t designed to replace a full-blown, old-school packet radio network – yet. What it does offer is its incredible weak-signal ability to “move the mail” (albeit slowly) when all you can hear is atmospheric noise!

### Simulated EOC/ARES Groups

In this column I use both simulated ARES examples and real-world examples. I created a simulated ARES group called “@SIMARES” and it consists of three EOCs: Location A (VA3A), Location B (VA3B) and Location C (VA3C). Location B is fortuitously equidistant between both Location C and Location A, which means it can provide 24/7 near vertical incidence skywave (NVIS) coverage for the other two (see Figure 2 on the next page).

**Note:** What NVIS is and how it’s used is beyond the scope of this column.

I’ve also created pseudo simulated @sub-groups: “@EOCA” for Location A, “@YEOCB” for Location B and “@EOCC” for Location C. In the real world you could use their respective civil aviation Canadian airport or weather station identifiers.

Each location’s EOC and its local area ARES members would add @SIMARES plus the appropriate @sub-group to their respective station/group lists. You’ll see why, later.

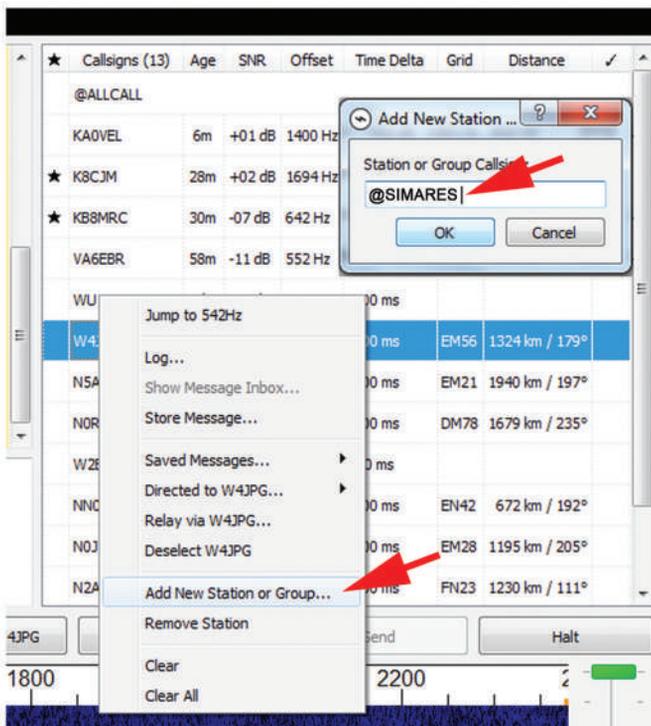


Figure 1B: Creating an @Group – Example 2

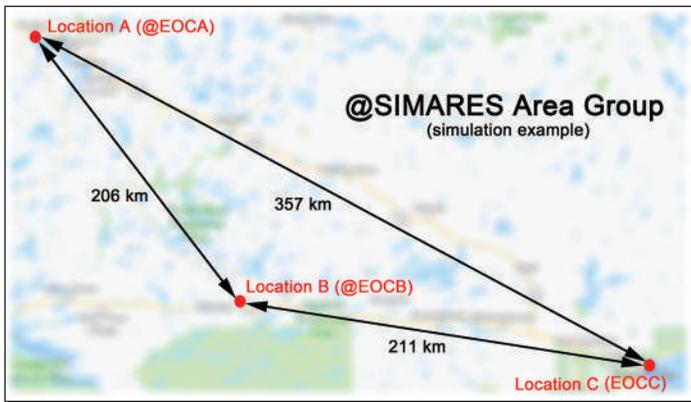


Figure 2: “@SIMARES Group EOC Area Map

### End-of-Transmission Character (Changed May 2019)

If you're a regular JS8Call user, you may have noticed that it always appended the sideways “electric arrow” or “ala” character to mark the end of transmission (EOT). Jordan, KN4CRD (JS8 and JS8Call's developer) changed that in version 1.0.1 and you can now program any EOT character using the JS8Call setup. I prefer the tilde “~” because it is a standard keyboard printable character and it looks like the “ala”, but others are using different text or even graphic EOT characters.

This change allows the use of a specific EOT character to trigger ancillary programs to process a received telemetry packet, or active/deactivate another program, or control remote devices connected to a Raspberry Pi µ-controller, etc – a “radio of things” instead of an “Internet of things”. This is possible because JS8Call has a built-in application program interface (API) whereby adept programmers can write and hook-in new program code to enhance its operation.

### AUTO, SPOT and HB

JS8Call “AUTO” mode must be enabled for all two-way messages/relays to work properly. “SPOT” must be enabled for APRS gating and APRS SMS Internet-connected stations in order to provide those services, but these can be receive-only monitoring stations (assuming you still have Internet service). In addition, the “Send HB (heartbeat) acknowledgements” must be disabled (see Figure 3) so JS8Call ARES stations don't get “distracted” when they may be exchanging traffic by hearing an HB beacon and transmitting an HB acknowledgment (ACK).

**Note:** The latest version of JS8Call disables this feature when in direct two-way communications with another (selected) station, but when you deselect the station it's automatically reactivated (the default action).

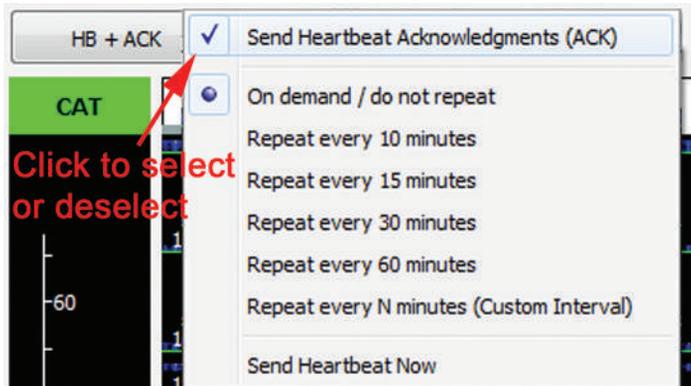


Figure 3: HB Settings Menu

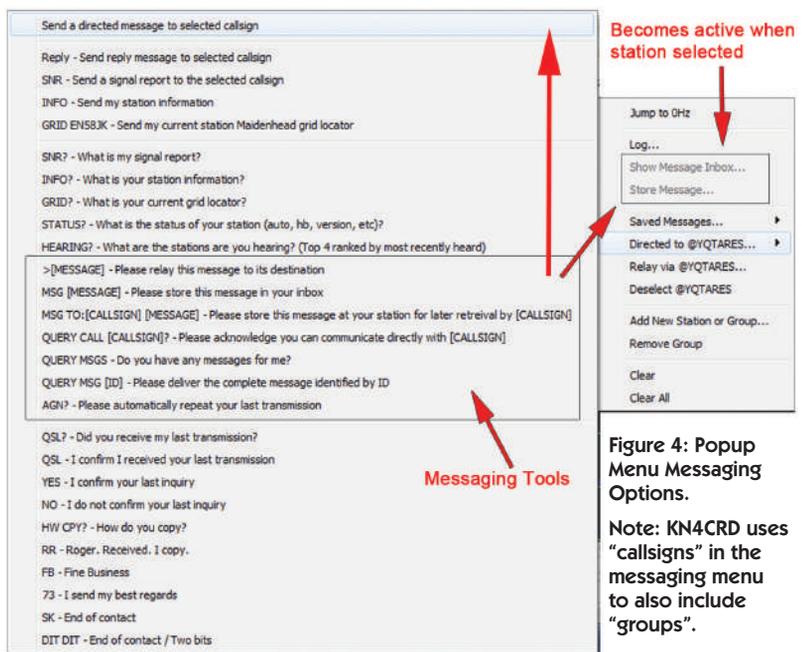


Figure 4: Popup Menu Messaging Options.

**Note:** KN4CRD uses “callsigns” in the messaging menu to also include “groups”.

### Informal Directed Messages

**Note:** Normally, you don't type in originating and destination call signs in text messages because JS8Call does this automatically; the exception is the relay where you must provide the call sign of the relay station involved.

The easiest way to send a directed message en masse is with a JS8Call group by selecting (mouse left-click on) the desired @group from the list of stations/groups (usually it's only “@ALLCALL”), then use the mouse right-click to access the popup messaging menu, select an option and type in your message, if required (see Figure 4 above).

For informal traffic, we don't need a printed or “hard” copy to give to a third party, or require a formal received acknowledgement (JS8Call's automatic “ACK”), or need to save a permanent copy of informal messages to a storage device.

For example:

1) EOC VA3C uses two different @group general calls. The first would be printed by every station on frequency within reception range because by default every JS8Call station is a member of @ALLCALL, unless they opt out. While the second is a targeted general call and would only be printed by ARES members of the “@SIMARES group.

VA3C: @ALLCALL EOC OPERATIONAL 121730Z ~

VA3C: “@SIMARES EOC OPERATIONAL 121730Z ~

2) Or we can narrow the area down even more.

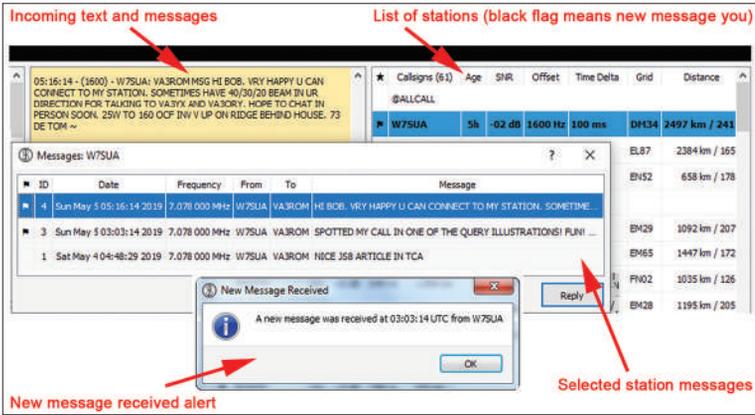
VA3A: @EOCA VHF FM SIMPLEX CHANNEL ALPHA ACTIVE ~

The Location A EOC is advising its local ARES members “@EOCA” pseudo @sub-group of the VHF simplex channel in use. Location C and Location B ARES don't really need to know this.

But most of the time we use JS8Call for keyboard-to-keyboard (kb-kb) directed messaging for informal chit-chats directed to a specific (selected) station and not a larger group. For ARES, kb-kb directed messaging would be used for tactical, short and sweet (concise) messages. For example, the VA3C EOC advises the VA3B EOC of its current status:

VA3C: VA3B EOC ACTIVATED 121230Z OPS NORMAL ~

Figure 5A: Various Information Windows using real-world examples



The operator at VA3B has two options: send a retransmission request if parts of the text from VA3C were lost (JS8Call marks this using an ellipsis or “. . .”); or they send an “RR” (meaning “ROGER, received, I copy, understood”).

VA3B: VA3C AGN? ~

VA3B: VA3C RR ~

### Formal Directed Messages

Currently, JS8Call has three methods we can use when it is required to save incoming copies of traffic for passing on to third parties, or during times when no one will be around to read them in real-time (FYI types of messages), or when you want to leave personal messages for another station that can be retrieved later (casual messages).

For all formal directed messages and relays, JS8Call automatically calculates and appends an alphanumeric three-character checksum (message verification code) to the text. The receiving station will generate another checksum based on the actual text it receives. If the two checksums match, the receiving station sends an automatic “ACK” of receipt back to the sender, stores the message in its local Message Inbox, and displays a popup message alert (see Figure 5A). Right now, JS8Call has no method for requesting automatic retransmissions of any missing data that causes mismatched checksums, but if you happen to be watching the incoming text screen, you can send a manual “AGN?” to the source station asking for a repeat.

**Note:** The prefix “MSG” or “MSG TO precede the text for formal directed messages.

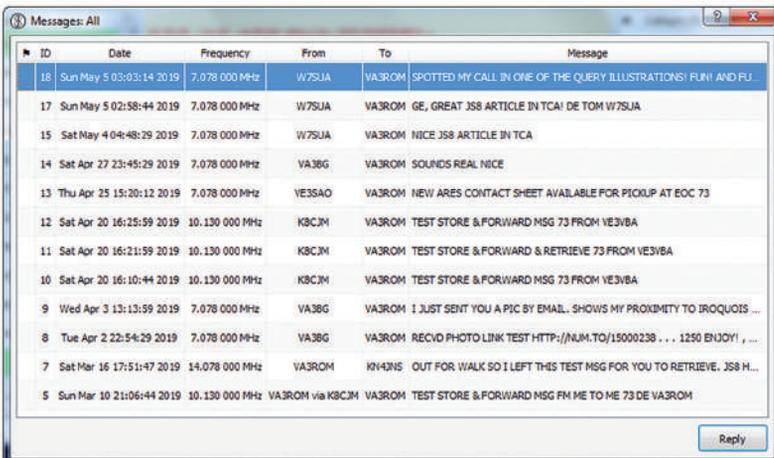


Figure 5B: Message Inbox using a real-world example. You can view all Messages sent/received from all stations or you can select a specific station to see which messages you and it have exchanged (see Figure 5A). However, it's very limited (no built-in editing or printing) so you'd have to cut and copy/paste text into a “proper” text editor for further processing.

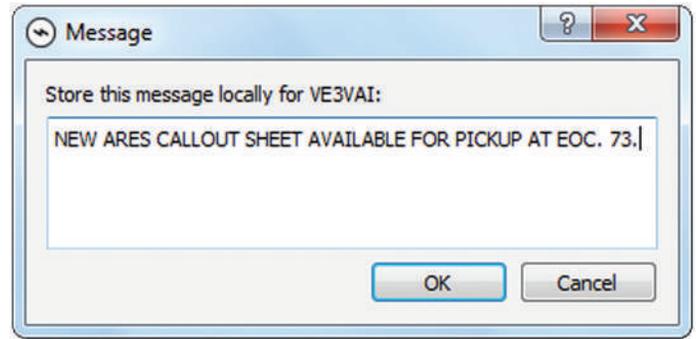


Figure 5C: Local Message Editor using a real-world example. I would prefer this method for all formal directed messaging (something more like Winlink 2000s.)

### Examples:

#### 1) Remote Message Storage and Retrieval

A JS8Call station can send a message to a second station and have it automatically stored in their Message Inbox for retrieval and action, if required.

VA3ROM: VA3C MSG RED CROSS HQ REQUESTS ONE MORE RO FOR MIDNIGHT SHIFT IF POSSIBLE. PLS ADVISE ASAP +aQ ~

#### 2) Remote Message Store and Forward

A JS8Call station can send a message to another station and have it automatically stored in their Message Inbox for retrieval by a third JS8Call station (avoids using a relay). Here VA3C stores a message in VA3B's mailbox for manual forwarding/retrieval by VA3A:

VA3C: VA3B MSG TO VA3A SPARE RADIO PARTS FOR LOCATION A EOC DEP ON FLIGHT 657 ETA YHD 1930Z. EaQ ~

#### 3) Local Message Storage and Retrieval

A JS8Call station can store messages in its own (local) Message Inbox, which is currently used for dual-purpose in/out messages, for other JS8Call stations to retrieve (see Figure 5B). This is best for local ARES use where you have individuals who all feed into one central control station (like a 24/7 EOC). But it can also be used to store messages for remote stations to retrieve, too, if propagation is usually good both ways (avoiding either a store and forward or relay).

**Note:** JS8Call uses a different method to create this type of locally stored message with a popup text editor (see Figure 5C).

### Directed Messages via Relay Station

I don't like using radio relays except, as a last resort, because:

1) Data transmission rate is cut in half. The relay station has to first receive and then immediately retransmit the message so it's tied up for twice as long, twice as many things can go wrong, and the relay station can't do anything else during the entire relay process.

2) You need a 100% solid communications channel connection with the originating, relay and destination stations during the entire process, which may not always be possible. This can cause checksum mismatches and the message won't be saved in the destination station's local Message Inbox, but the text (at least parts, if not all) should still be printed on their screen.

```

15:58:15 - (1200) - VA3ROM: K8CJM> VE3VBA RELAY MESSAGE TEST PB7 ~
15:59:14 - (1197) - K8CJM: VE3VBA> RELAY MESSAGE TEST VIA VA3ROM ~
15:59:45 - (1200) - VE3VBA: K8CJM> VA3ROM ACK 5G2 ~
16:00:44 - (1197) - K8CJM: VA3ROM> ACK VIA VE3VBA ~

```

Figure 6: Message Relay using a real-world example. VA3ROM relay message via K8CJM to VE3VBA. K8CJM receives the message and immediately retransmits it to VE3VBA. If the checksum is good, VE3VBA sends an ACK to K8CJM, which is relayed to VA3ROM. Note: A right angle bracket ">" separates the original and relay stations from the start of text, with "VIA CALLSIGN" appended to the text.

If you do decide to use a relay, once JS8Call begins the transmission all operations between the three stations involved become automatic ("AUTO" mode must be enabled) with the obligatory checksums and ACKs (see Figure 6).

### Query JS8Call Stations for Messages

JS8Call has several ways to see if anyone has traffic for you:

- 1) Check your JS8Call Message Inbox on a regular basis (see Figure 5B). Also scroll back through the incoming text screen just in case traffic for your station was received but didn't get stored because of mismatched checksums.
- 2) If someone sent you mail, there will be a small black flag next to their call sign in the station list. That notice will stay there until you check your Message Inbox.
- 3) Transmit a heartbeat (HB) status beacon at regular intervals for normal JS8Call use. A station with traffic for you (stored on their computer) and who hears your HB will transmit the normal signal-to-noise ratio (SNR) report appended with a unique message identification number. *Note: for ARES stations it should be disabled as mentioned earlier.* For example: W7SUA, with whom I've exchanged a few messages, hears my HB beacon and has a message on file for me. My HB is acknowledged with an SNR report and the message identification number.
 

```

VA3ROM: HB AUTO RELAY SPOT EN58 ~
W7SUA: VA3ROM ACK +2 MSG ID 12 ~

```
- 4) Use the "@ALLCALL" group broadcast to ask all who can hear you if they have any messages for you, or you can just query a specific group. If you don't get any answer(s) back then you have your answer (or no one heard you!).
 

```

VA3ROM: @ALLCALL QUERY MSGS? ~
W7SUA: VA3ROM YES MSG ID 12 ~
VA3ROM: "@SIMARES QUERY MSGS? ~
VA3ROM: @EOCC QUERY MSGS? ~

```
- 5) Directly query a selected station. VA3B queries VA3C for any messages on file. VA3C can either reply back in the affirmative, along with the message identification number, or in the negative.
 

```

VA3B: VA3C QUERY MSGS? ~
VA3C: VA3B YES MSG ID 234 ~
VA3C: VA3B NO ~

```

**Note:** JS8Call stations automatically reply back ("AUTO" mode must be enabled) when hearing any message queries – no operator intervention required.

### Retrieving Messages from JS8Call Stations

Once you know the station(s) with traffic for you, and the message identification number(s) to use, you then manually retrieve them one by one. The JS8Call station at the other end will switch into automatic transmission mode ("AUTO" must be enabled), and you can sit back and watch the action. The station verifies the message identification number you send and, if valid, will transmit the message along with an appended checksum.

Your JS8Call receiving station will verify the checksum and if it is good an automatic ACK is sent back, a copy of the message is saved in your Message Inbox, and a popup message alert box is displayed. For example, I retrieve the locally stored message W7SUA has on file for me:

```

VA3ROM: W7SUA QUERY MSG 12 UFX ~
W7SUA: VA3ROM MSG GREAT JS8CALL ARTICLE! 73 aRT ~
VA3ROM: W7SUA ACK ~

```

**Note:** If any part of the message was marked by an ellipsis, no ACK would be sent because this causes checksum errors so I would have to transmit a manual "AGN?". KN4CRD still has a lot of work to do in this area, but it's very promising!

### Sample ARES JS8Call Applications

Here are a few edited posts taken from the JS8Call user group (groups.io):

"Members of the Radio Amateur Emergency Network (RAYNET) in Surrey, England, are using JS8Call with the HF Resilient Messaging Network (HFRMN). While some may only use JS8 for QSOs, the real brilliance of JS8Call is its messaging, relay and mesh network capabilities. Over the HFRMN, we have communicated significant weather issues, SITREPS, incidents, welfare checks, sent APRS posits to the aprs.fi and findU.com web servers, and have sent small but key radio emails, and much more. Using only 8 watts and an 80m band mobile whip, we have made NVIS communications out to 200 kilometres during the day and farther out at night. It probably wouldn't require that many 24/7 JS8Call stations to cover the entire UK on the low HF radio bands. We are also looking at building small standalone JS8Call portable/mobile units using Raspberry Pi's and SDR transceivers."

"In the Netherlands, the Dutch Amateur Radio Emergency Service (DARES) is testing JS8Call on the 2m band, and it's very promising because with 10 to 20 watts we have made simplex contacts out to 80 kilometres (line of sight), while voice and other digital modes failed at the same distance. All the features of messaging and relays are very useful for weak-signal emergency communications."

### My Final

Well, that's JS8Call in a nutshell. Hopefully, most of what I've written about it won't change too much by the time you read this. But it's evolving rapidly and KN4CRD says he has a lot more in store for us.

As one member of the JS8Call user group posted:

"The applications of JS8 are limited more by imagination than design!" – 73