

SEPT. 2005

*“The new industry standard
driver and final RF power transistor.”*

Introducing...

EKL Components' ERF-2030 RF Power Transistor and EN-Prefix Companion Parts

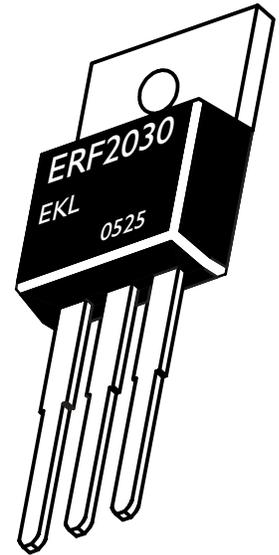
Everyone is in a panic! Last year, Mitsubishi discontinued the 3 most popular transistors in our industry - the 2SC2166, 2SC1969, and 2SC2312. These parts are already becoming scarce and prices are skyrocketing!

The panic is over! The ERF-2030 is a versatile 25 watt* RF transistor that can replace ALL THREE discontinued Mitsubishi parts!

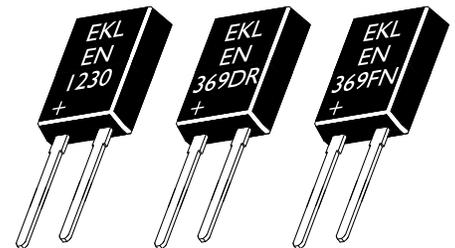
ERF-2030 Features...

- 1) The ERF-2030 is a 25 watt* transistor - therefore, it is not just a replacement part, but also an **UPGRADE** to the old Mitsubishi parts.
Example: EKL Components has a documented modification for turning a Galaxy 33 into a 50 watt radio using the 3pcs of the ERF-2030 and 2 companion parts.
- 2) The ERF-2030 is not an 'electrical drop-in replacement' for the 2SC2166, 2SC1969, and 2SC2312. However, circuit modifications on most radios are minimal and documentation is readily available for **FREE**.
- 3) The ERF-2030 is a 'mechanical drop-in replacement' for the 2SC2166, 2SC1969, and 2SC2312. This means that the ERF-2030 features a TO-220 package with the **SAME** pinout configuration as the 2SC2166, 2SC1969, and 2SC2312. Therefore, **NO** mechanical modifications to the ERF-2030 are necessary for most installations.
- 4) EKL Components manufactures a series of companion parts to the ERF-2030. The EN-1230, EN-369DR, and EN-369FN are available to make radio modifications easier and maximize performance.
- 5) **PRICE!!!**
Example: To do the Galaxy 33, 50 watt modification, a dealer would need to buy three ERF-2030's and two EN-369DR's - for a total dealer cost of around \$11.00. The current market price for a SINGLE 2SC1969 is almost \$10.00. Making the ERF-2030 and EN companion parts the smart choice!

* EKL Components rates the ERF-2030 at 25 watts PEP. This is a **CONSERVATIVE** rating! In lab tests and real world modifications, a single ERF-2030 has produced as much as 40 watts PEP. ALL results will vary and are solely determined by the circuit surrounding the ERF-2030.



ERF-2030
25 Watt*
RF Transistor
for Mobile Radios



EN-1230
EN-369DR
EN-369FN
Companion Parts
Maximizes Performance
Simplifies Installations

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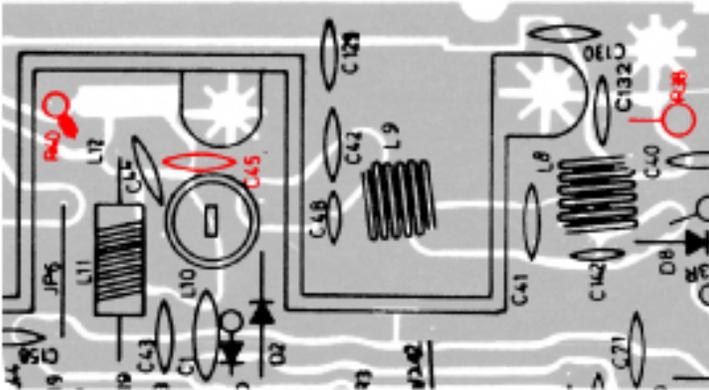
40 Watt, High Power Mod. for Cobra 25, Uniden 66, and Uniden 68 Radios - revised 10-26-2005

Parts List for Mod.:

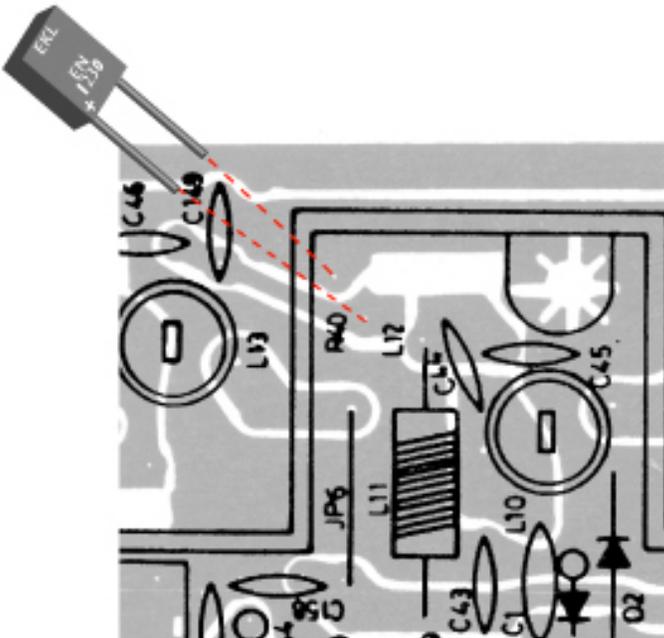
- 1pc EKL Components' EN-1230
- 1pc EKL Components' ERF-2030
- *1pc 68pF Ceramic Capacitor
- *Mica or Ceramic Insulator
- *Heatsink Compound

*These parts may not be needed. See instructions.

1) Remove R38, R40, C45

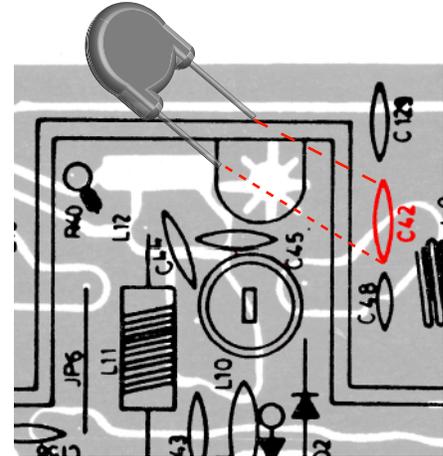


2) Install EKL Components' EN-1230 at R40. The EN-1230 is a POLARIZED part. Make sure that it is installed correctly with the positive lead toward L12.



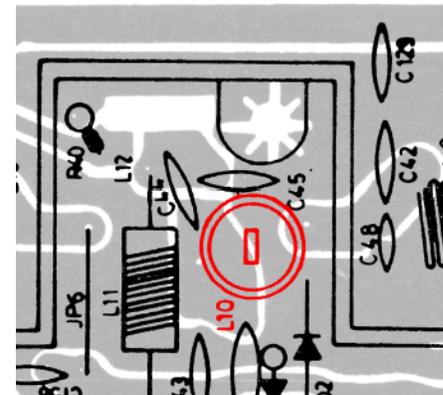
3) Add 68pF capacitor across C42. Install on solder side of PCB. Leave C42 alone.

NOTE: Adding the 68pF capacitor improves performance results on MOST units. There are some older model Cobras that it may not be necessary to add the 68pF capacitor. Test with and without to determine best results.



4) Remove tuning slug from L10 and discard.

NOTE: One old model of Cobra 25 utilized a smaller tuning coil at L10. On these units, you must leave the tuning slug in it for maximum results.



5) Remove TR7 (the 2SC2078), and install EKL Components' ERF-2030 in its place with stock insulator, washer, and screw.

NOTE: The ERF-2030 has the same pin-out as the 2SC2078, so the parts install the exact same way. The use of a good insulator is CRITICAL for the ERF-2030. If the stock insulator is cracked or damaged, then use a new mica or ceramic insulator. Make sure to use heatsink compound to help with additional heat dissipation.

40 Watt, High Power Mod. for Cobra 29, Uniden 76, and Uniden 78 Radios

Parts List for Mod.:

1pc EKL Components' EN-1230

1pc EKL Components' ERF-2030

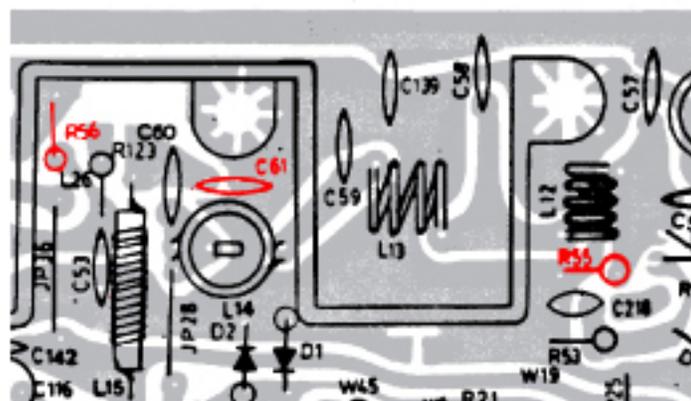
*1pc 68pF Ceramic Capacitor

*Mica or Ceramic Insulator

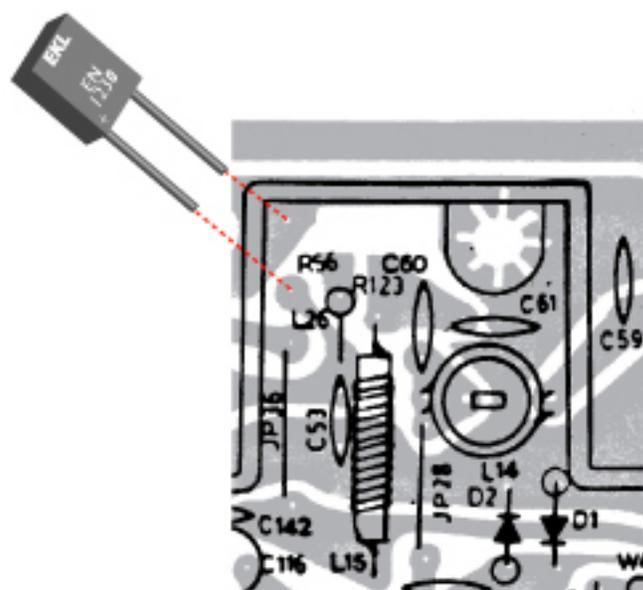
*Heatsink Compound

*These parts may not be needed. See instructions.

1) Remove R55, R56, C61

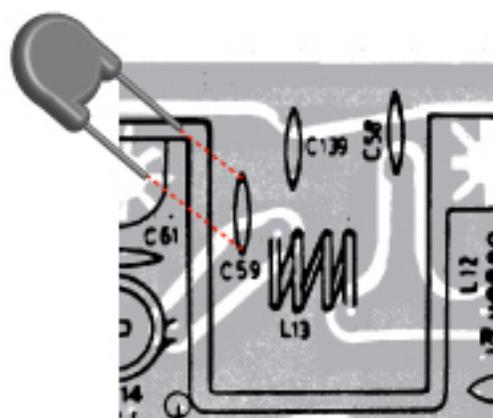


2) Install EKL Components' EN-1230 at R56. The EN-1230 is a POLARIZED part. Make sure that it is installed correctly with the positive lead toward R123.



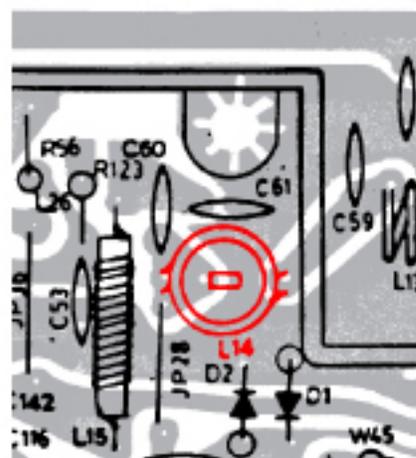
3) Add 68pF capacitor on back of C59. Install on solder side of PCB. Leave C59 capacitor alone.

NOTE: Adding the 68pF capacitor improves performance results on MOST units. There are some older model Cobras that it may not be necessary to add the 68pF capacitor. Test with and without to determine best results.



4) Remove tuning slug from L14 and discard.

NOTE: One old model of Cobra 29 utilized a smaller tuning coil at L14. On these units, you must leave the tuning slug in it for maximum results.



5) Remove TR14 (the 2SC2078), and install EKL Components' ERF-2030 in its place with stock insulator, washer, and screw.

NOTE: The ERF-2030 has the same pin-out as the 2SC2078, so the parts install the exact same way. The use of a good insulator is CRITICAL for the ERF-2030. If the stock insulator is cracked or damaged, then use a new mica or ceramic insulator. Make sure to use heatsink compound to help with additional heat dissipation.

Cobra 148 GTL 25 Watt Modifications Using ERF-2030

Below are 2 modifications for the 148 GTL. Both modifications are approx. 25 watts. Modification #1 only replaces the final. Modification #2 replaces both driver and final. This modification is for the latest production 148 GTL with 4pin microphone plug. It is unknown if this modification will work on previous 148 GTL units.

148 GTL Modification #1 - Final Transistor Replacement Only

Required Parts:

1pc ERF-2030
1pc EN-369FN
1pc 470pF ceramic disc capacitor
1pc 33K ohm, 1/4 watt resistor
jumper wire

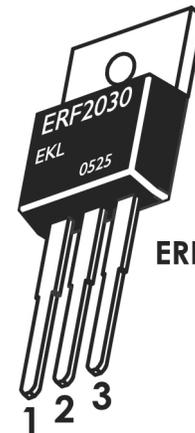
- 1) Remove L40
- 2) Remove C149
- 3) Remove R181
- 4) Remove TR36 and replace with ERF-2030. Note: ERF-2030 mounts identically to the removed 2SC1969. Make sure to use all the same hardware, insulator, thermal grease, etc.
- 5) Install jumper wire at R181
- 6) Add 470pF ceramic disc capacitor across C152
- 7) Install EN-369FN at TR36 (on solder side of PCB). Solder the positive lead (+) to the ERF-2030 gate. Solder the negative lead (unmarked) to the ERF-2030 source.
- 8) Add 33K ohm resistor (1/4 watt) from ERF-2030 gate leg to R180

148 GTL Modification #2 - Driver and Final Transistor Replacement

Required Parts:

2pcs ERF-2030
1pc EN-369DR
1pc EN-369FN
1pc 1000pF ceramic disc capacitor
1pc 33K ohm, 1/4 watt resistor
1pc 470K ohm, 1/4 watt resistor
jumper wire

- 1) Remove L40
- 2) Remove C149
- 3) Remove C156
- 4) Remove R209
- 5) Remove L43
- 6) Remove C200
- 7) Remove C151
- 8) Remove R181
- 9) Remove TR36 and TR38. Replace both with ERF-2030s. Note: ERF-2030 mounts identically to the removed 2SC2166 and 2SC1969. Make sure to use all the same hardware, insulator, thermal grease, etc.
- 10) Install jumper wire at R181
- 11) Add 1000pF ceramic disc capacitor across C152
- 12) Install EN-369DR at TR38 (solder side of PCB). Solder the positive lead (+) to the ERF-2030 gate. Solder the negative lead (unmarked) to the ERF-2030 source.
- 13) Install EN-369FN at TR36 (solder side of PCB). Solder the positive lead (+) to the ERF-2030 gate. Solder the negative lead (unmarked) to the ERF-2030 source.
- 14) Add 33K ohm resistor (1/4 watt) from ERF-2030 gate leg at TR36 to R180
- 15) Add 470K ohm resistor (1/4 watt) from ERF-2030 gate leg at TR38 to JW48
- 16) Remove the 270pF capacitor soldered from junction of C151, C152, R181 to ground. This 270pF capacitor is on the solder side of PCB.



ERF-2030 Pins:

1. Gate
2. Drain
3. Source

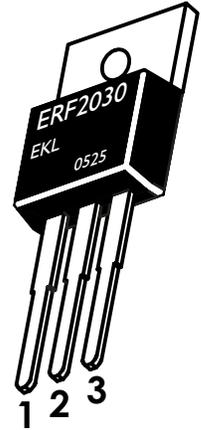
This application note describes how to substitute an ERF-2030 for the discontinued Mitsubishi 2SC1969 final RF transistor in the Galaxy DX33HML, DX44V, DX55V, DX66V, and DX73V 10 meter transceivers. This application note may apply to other similar transceivers manufactured by RCI.

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Required Parts:

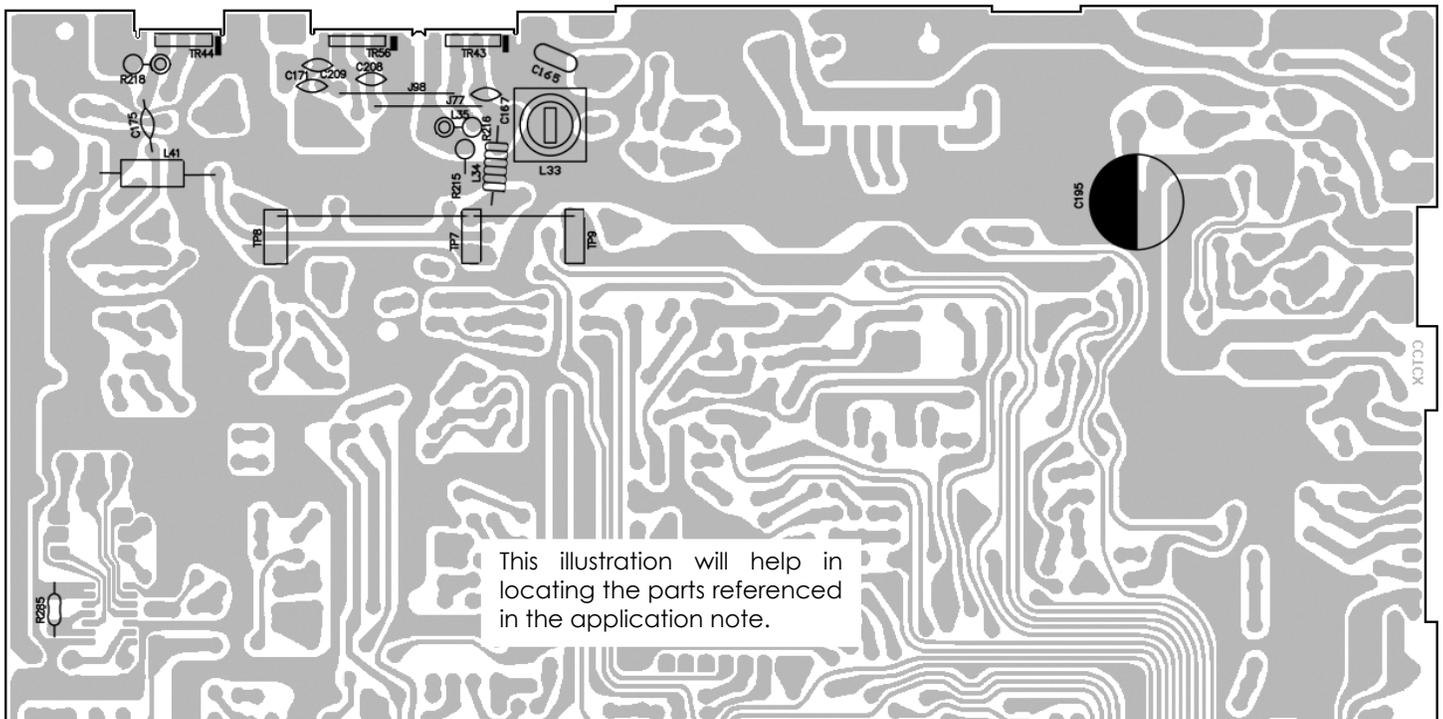
- 1pc ERF-2030
- 1pc EN-369DR
- 1pc 68pF Ceramic Disc Capacitor (optional, see below)

- 1) Remove the 2SC1969 at TR43.
- 2) Install the ERF-2030 at TR43. Install ERF-2030 exactly the same way the 2SC1969 was installed, using all the SAME HARDWARE that was used with the 2SC1969.
- 3) Remove capacitor at C167.
- 4) Remove the 22μH choke installed from location R215 to R216.
- 5) Install the EN-369DR at TR43. Install this part on the solder side of the PCB. **IMPORTANT:** Do NOT stress the leads of the EN-369DR by bending them to aggressively. Bend the leads carefully and make sure that they are as short as possible.
 - a) Solder the EN-369DR positive lead (marked +) to the gate pin of the ERF-2030 at TR43.
 - b) Solder the EN-369DR negative lead (unmarked) to the source pin of the ERF-2030 at TR43.
- 6) Install a 68pF capacitor across C165 (this step is optional, but should help to maximize output power).
- 7) Remove tuning slug from L33 (this step is optional, but should help to maximize output power).



ERF-2030 Pins:

- 1. Gate**
- 2. Drain**
- 3. Source**



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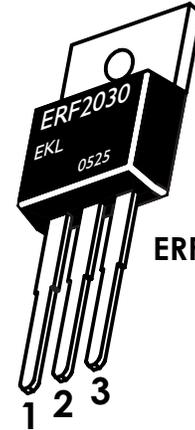
If you do not agree to the above terms, please return the parts and information to the place of purchase.

This application note describes how to substitute/add a total of three ERF-2030s for the discontinued Mitsubishi 2SC1969 and 2SC2166 RF transistors in the Galaxy DX33HML, DX44V, DX55V, DX66V, and DX73V 10 meter transceivers. This application note may apply to other similar transceivers manufactured by RCI.

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Required Parts:

- 3pc ERF-2030
- 1pc EN-369DR
- 1pc EN-369FN
- 1pc 480K ohm, 1/4 watt Resistor
- 1pc 1500pF Ceramic Disc Capacitor
- 1pc 100 ohm, 1/4 watt Resistor
- TO-220 Transistor Hardware Kit (Insulator, Washer, Screw/Nut, Thermal Grease)
- Insulated Jumper Wire
- 1pc 68pF Ceramic Disc Capacitor (optional - see below)
- 1pc Aluminum Heatsink (optional - see below)



ERF-2030 Pins:
1. Gate
2. Drain
3. Source

- 1) Remove the 2SC1969 at TR43.
- 2) Remove the 2SC2166 at TR44.
- 3) Install the ERF-2030's at TR43, TR56, and TR44. Install ERF-2030's exactly the same way the 2SC1969 and 2SC2166 were installed, using all the SAME HARDWARE. When adding the ERF-2030 at the TR56 location, make sure to use the necessary transistor hardware (insulator, washer, screw/nut, thermal grease).
- 4) Install the EN-369DR at TR44. Install this part on the solder side of the PCB. **IMPORTANT:** Do NOT stress the leads of the EN-369DR by bending them to aggressively. Bend the leads carefully and make sure that they are as short as possible.
 - a) Solder the EN-369DR positive lead (marked +) to the gate pin of the ERF-2030 at TR44.
 - b) Solder the EN-369DR negative lead (unmarked) to the source pin of the ERF-2030 at TR44.
- 5) Install the EN-369FN at TR43. Install this part on the solder side of the PCB. **IMPORTANT:** Do NOT stress the leads of the EN-369FN by bending them to aggressively. Bend the leads carefully and make sure that they are as short as possible.
 - a) Solder the EN-369FN positive lead (marked +) to the gate pin of the ERF-2030 at TR43.
 - b) Solder the EN-369FN negative lead (unmarked) to the source pin of the ERF-2030 at TR43.
- 6) Remove capacitor at C167.
- 7) Remove the 22µH choke installed from location R215 to R216.
- 8) Remove the 22µH choke installed in one of the holes at location R218.
- 9) Remove the 560pF capacitor that is connected from TR44 (driver) to TR43 (final). There is no designator for this part.
- 10) Install jumper wire at J77.
- 11) Install jumper wire at J98.
- 12) Install jumper wire from the left hole at C208 to the right hole at C171. See illustration below for radio orientation.
- 13) Install 1500pF capacitor at C209.
- 14) Remove resistor at R285.
- 17) Add 100 ohm resistor at R285.
- 18) Install the 480K ohm resistor from the right pad at L41 to the pad closest to the back of the radio at C175. It will be easiest to install this part on the solder side of the PCB. See illustration for radio orientation.

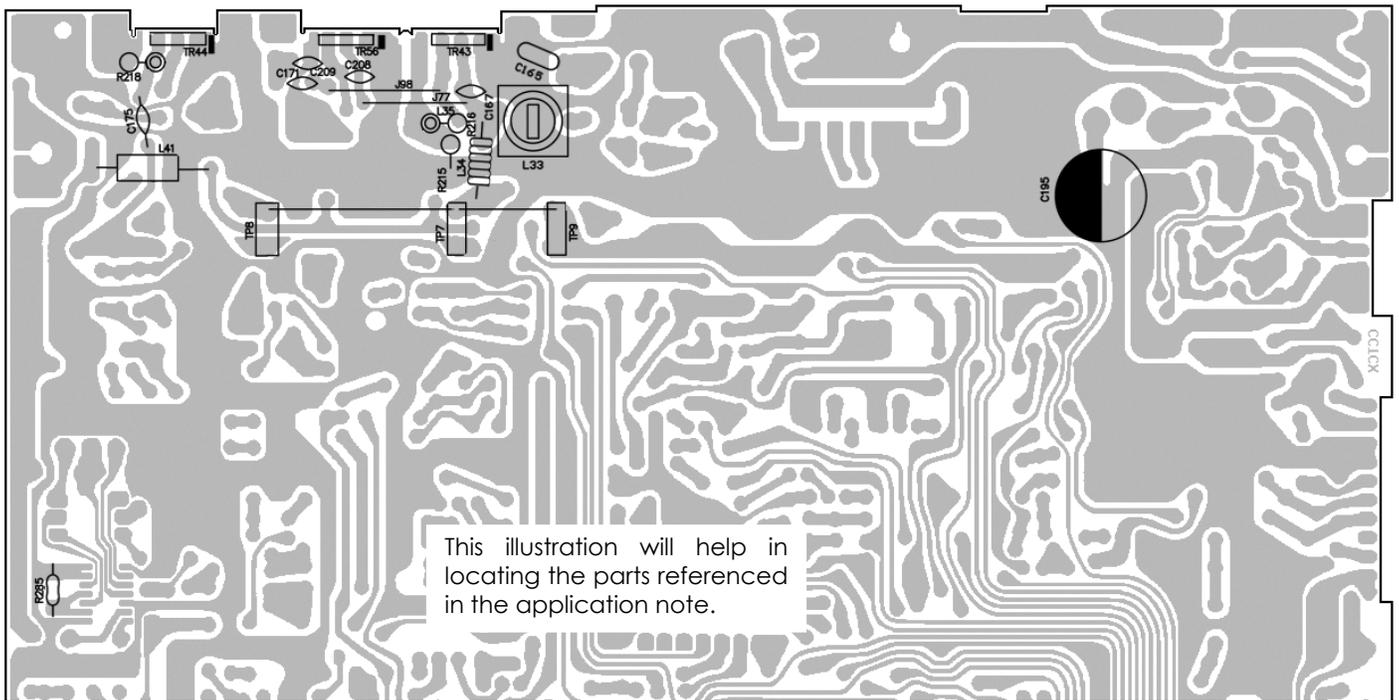
NOTE: Steps 19 through 25 are optional and are not necessary for a functioning radio. However, these steps may increase power and performance.

- 19) Remove jumper wire from TP8 to TP7.
- 20) Remove jumper wire from TP7 to TP9.
- 21) Install jumper wire from TP8 to TP9.
- 22) Install jumper wire from TP7 to the positive (+) 13.8 volts at C195. It will be easiest to install this wire on the solder side of the PCB.
- 23) Install the 68pF capacitor across C165.
- 24) Remove tuning slug from L33.
- 25) Install an aluminum heatsink from a dual final Galaxy radio on the rear chassis of the radio.

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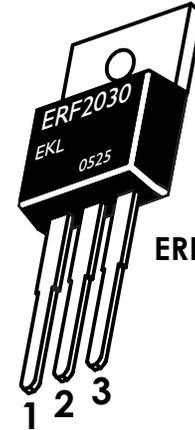
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This application note describes how to substitute a total of three ERF-2030s for the discontinued Mitsubishi 2SC1969, 2SC2312, and 2SC2166 RF transistors in the Galaxy DX77HML, DX88HL, and DX99V 10 meter transceivers. This application note may apply to other similar transceivers manufactured by RCI.

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Required Parts:

3pc ERF-2030
1pc EN-369DR
1pc EN-369FN
1pc 480K ohm, 1/4 watt Resistor
1pc 33K ohm, 1/4 Resistor
1pc 1500pF Ceramic Disc Capacitor
1pc 100 ohm, 1/4 watt Resistor
Insulated Jumper Wire



ERF-2030 Pins:
1. Gate
2. Drain
3. Source

- 1) Remove the 2SC1969 or 2SC2312 at TR43.
- 2) Remove the 2SC1969 or 2SC2312 at TR56.
- 3) Remove the 2SC2166 at TR44.
- 4) Install the ERF-2030's at TR43, TR56, and TR44. Install ERF-2030's exactly the same way the 2SC1969/2312 and 2SC2166 were installed, using all the SAME HARDWARE.
- 5) Install the EN-369DR at TR44. Install this part on the solder side of the PCB. IMPORTANT: Do NOT stress the leads of the EN-369DR by bending them to aggressively. Bend the leads carefully and make sure that they are as short as possible.
 - a) Solder the EN-369DR positive lead (marked +) to the gate pin of the ERF-2030 at TR44.
 - b) Solder the EN-369DR negative lead (unmarked) to the source pin of the ERF-2030 at TR44.
- 6) Install the EN-369FN at TR43. Install this part on the solder side of the PCB. IMPORTANT: Do NOT stress the leads of the EN-369FN by bending them to aggressively. Bend the leads carefully and make sure that they are as short as possible.
 - a) Solder the EN-369FN positive lead (marked +) to the gate pin of the ERF-2030 at TR43.
 - b) Solder the EN-369FN negative lead (unmarked) to the source pin of the ERF-2030 at TR43.
- 7) Remove capacitor at C167.
- 8) Remove the 22μH choke installed from location R216 to L35.
- 9) Remove the 22μH choke installed from location R271 to L50.
- 10) Remove 2.2 ohm resistor and ferrite bead installed from R218 to L47.
- 11) Remove C209.
- 12) Install 1500pF capacitor at C209.
- 13) Remove C171.
- 14) Install jumper wire from the left hole at C208 to the right hole at C171. See illustration below for radio orientation.
- 15) Remove resistor at R285.
- 16) Add 100 ohm resistor at R285.
- 17) Install the 480K ohm resistor from the right pad at L41 to the pad closest to the back of the radio at C175. It will be easiest to install this part on the solder side of the PCB. See illustration for radio orientation.
- 18) Install the 33K ohm resistor from the pad (hole) marked R271 to the pad closest to the front of the radio at R272. It will be easiest to install this part on the solder side of the PCB. See illustration for radio orientation.

The following parts are no longer in the circuit, so they can be removed or left alone - it does not matter.

VR10, VR11, VR20
C173, C210
R270, R271, R215, R217

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This application note describes how to substitute ERF-2030's for the discontinued Mitsubishi 2SC2166 and 2SC1969 RF transistors in the Magnum S-3, S-6 and S-9 10 meter transceivers.

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Required Parts:

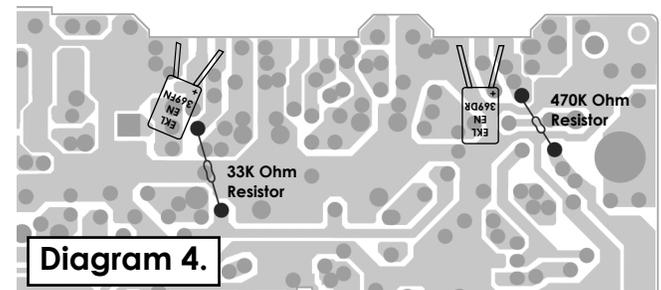
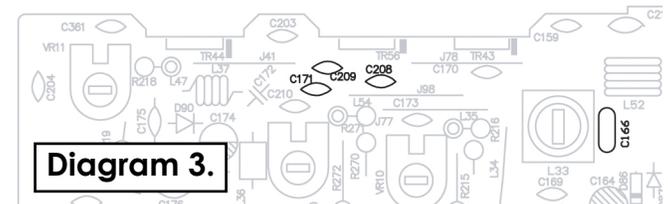
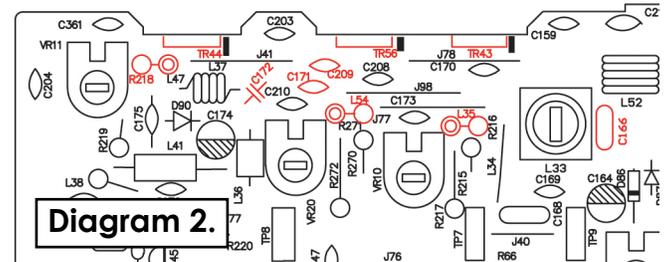
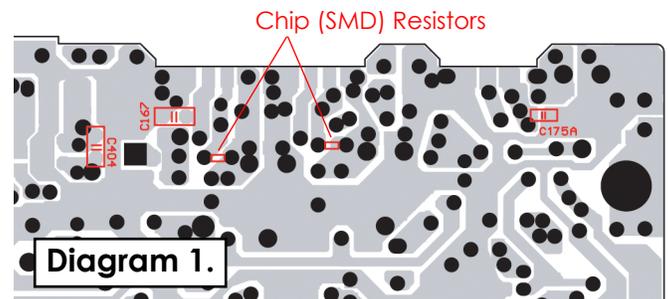
- 3pc ERF-2030
- 1pc EN-369DR
- 1pc EN-369FN
- 1pc 1500pF Ceramic Disc Capacitor
- 1pc 1000pF, 300V Dipped Silver Mica Capacitor
- 1pc 470K ohm, 1/4 Watt Resistor
- 1pc 33K ohm, 1/4 Watt Resistor
- Insulated Jumper Wire

ERF-2030 Pins:

1. Gate
2. Drain
3. Source



- 1) On the solder side of the main PCB, remove C175A, C167 and C404. See diagram 1.
- 2) On the solder side of the main PCB, remove the 2 chip (SMD) resistors that are across L54 and L35. There are no designators for these resistors. See diagram 1.
- 3) On the component side of the main PCB, remove C166, C172, R218 (with RF bead), L35, L54, C209 and C171. See diagram 2.
- 4) Remove TR43, TR44 and TR56. See diagram 2. **IMPORTANT:** Save ALL mounting hardware for installation of ERF-2030 transistors.
- 5) Install the ERF-2030's at TR43, TR56, and TR44. Install ERF-2030's exactly the same way the 2SC1969's and 2SC2166 were installed, using all the SAME HARDWARE.
- 6) On component side of main PCB, install jumper wire from right hole of C171 to left hole of C208. See diagram 3.
- 7) On component side of main PCB, install 1500pF ceramic disc capacitor at C209. See diagram 3.
- 8) On component side of main PCB, install 1000pF, 300V dipped silver mica capacitor at C166. See diagram 3.
- 9) On the solder side of the main PCB, install 470K ohm resistor from gate of TR44 (the driver) to the junction of R219 & L41. See diagram 4.
- 10) On the solder side of the main PCB, install 33K ohm resistor from gate of TR43 to R217. See diagram 4.
- 11) On the solder side of the main PCB, install the EN-369DR at TR44. **IMPORTANT:** Do NOT stress the leads of the EN-369DR by bending them too aggressively.
 - a) Solder the EN-369DR positive lead (marked +) to the gate pin of the ERF-2030 at TR44.
 - b) Solder the EN-369DR negative lead (unmarked) to the source pin of the ERF-2030 at TR44.
- 12) Install the EN-369FN at TR43. **IMPORTANT:** Do NOT stress the leads of the EN-369FN by bending them too aggressively.
 - a) Solder the EN-369FN positive lead (marked +) to the gate pin of the ERF-2030 at TR43.
 - b) Solder the EN-369FN negative lead (unmarked) to the source pin of the ERF-2030 at TR43.



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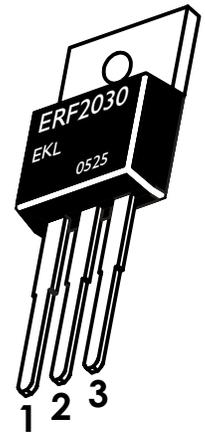
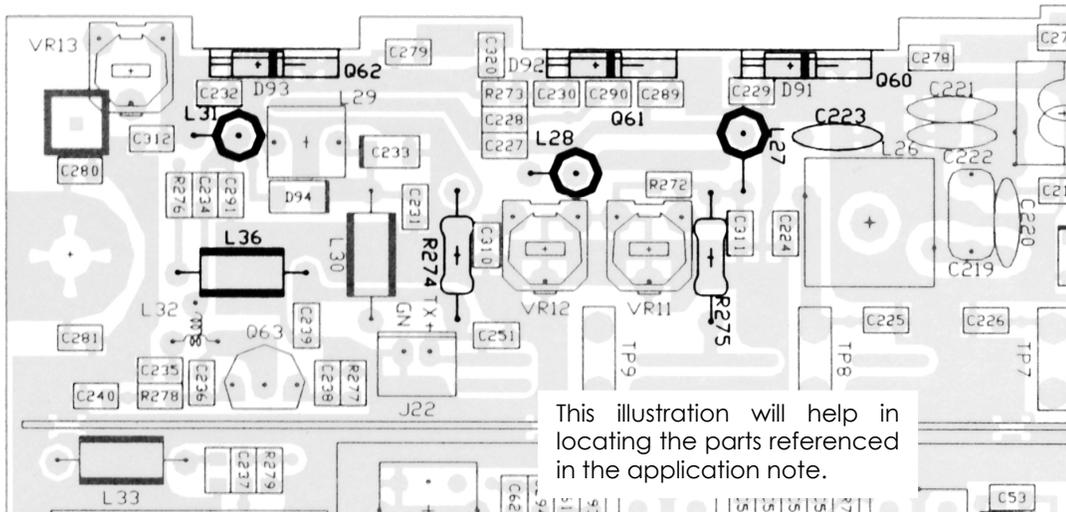
This application note describes how to substitute ERF-2030s for the discontinued Mitsubishi 2SC2166 and 2SC1969 RF transistors in the RCI-6900F25 and RCI-2950 DX 10 meter transceivers.

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Required Parts:

- 3pc ERF-2030
- 1pc EN-369DR
- 2pcs EN-369FN
- 1pc 470K ohm, 1/4 Watt Resistor
- 2pcs 33K ohm, 1/4 Watt Resistor

- 1) Remove Q60, Q61 and Q62.
- 2) Remove L27, L28 and L31.
- 3) Remove C223.
- 4) Install the three ERF-2030's at Q60, Q61 and Q62. Install the ERF-2030's exactly the same way the 2SC2166 and 2SC1969's were installed, using all the SAME HARDWARE.
- 5) Install the EN-369DR at Q62. Install this part on the solder side of the PCB. **IMPORTANT:** Do NOT stress the leads of the EN-369DR by bending them too aggressively. Bend the leads carefully and make sure that they are as short as possible.
 - a) Solder the EN-369DR positive lead (marked +) to the gate pin of the ERF-2030 at Q62.
 - b) Solder the EN-369DR negative lead (unmarked) to the source pin of the ERF-2030 at Q62.
- 6) Install the EN-369FN's at Q60 and Q61. Install these parts on the solder side of the PCB. **IMPORTANT:** Do NOT stress the leads of the EN-369FN's by bending them too aggressively. Bend the leads carefully and make sure that they are as short as possible.
 - a) Solder the EN-369FN's positive lead (marked +) to the gate pin of the ERF-2030's at Q60 and Q61.
 - b) Solder the EN-369FN's negative lead (unmarked) to the source pin of the ERF-2030's at Q60 and Q61.
- 7) Install the 470K ohm resistor from the gate pin of the ERF-2030 at Q62, to the jumper wire located at L36.
- 8) Install a 33K ohm resistor from the gate pin of the ERF-2030 at Q60, to the hole at R275 that is closest to the front of the radio.
- 9) Install a 33K ohm resistor from the gate pin of the ERF-2030 at Q61, to the hole at R274 that is closest to the front of the radio.



ERF-2030 Pins:
1. Gate
2. Drain
3. Source

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