



RF



ORANGE COUNTY AMATEUR RADIO CLUB, INC.

VOL. LXII NO. 08

P.O. BOX 3454, TUSTIN, CA 92781

August 2021

The Prez Sez...

By Nicholas AF6CF



August is now here, and this means that there is less than a year to the next ARRL Field Day! Seriously speaking, we hope that next year will be at least as successful as this one was. We have big plans for the rest of the year, including the Club Auction in October and a few excellent speakers for this month and November meetings. This month we have scheduled a really good speaker, talking about "Receiver Optimization" (page 13) so we can learn how to extract the best out of our radios. (You can't talk to them if you don't hear them).

Due to the lingering Covid-19 issues, most of the meetings will still be "virtual". So mark your calendars and do not miss this presentation. Once again, thanks to the generosity of its members, the Club did not lose money on the Field Day activity as generally expected. The Christmas party date is already set for December 10th and now the VP and the Activities chair are busily working on the preparations. As usual, I look forward to an eyeball contact with you all at the next General Meeting.

73 DE AF6CF



NEXT MEETING

August 20th, 2021

Join us Via ZOOM at 7:00PM!

**Current OCARC members
will receive an EMAIL with
instructions. Early check-in
available at 6:30 PM(+)**

August Speaker

Doug Millar

K6JEY

**"Receiver
Optimization"**

SPECIAL NOTICE:

**During the COVID-19
pandemic ALL OCARC Nets
will Remain Active!**

See page 2.

In This Issue

The Prez Sez	1
Club Information	2
OCARC July General Mtg Minutes	3
OCARC Radio Nets	6
OCARC Board Meeting Minutes	7
RadioActivity	9
CARA Radio Net-at-Nine	11
Important Message to OCARC	12
Background on K6JEY	13
Submit an article	14
Heath IP-2718 Tri-Power Supply	15
Cash Flow Report	27
Ad for MiniTiouner-Express DATV	28

**2021 Board of Directors:****President:**

Nicholas Haban, AF6CF
(714) 693-9778
af6cf@w6ze.org

Vice President:

Tim Goeppinger, N6GP
(714) 730-0395
n6gp@w6ze.org

Secretary:

Corey Miller, KE6YHX
(714) 322-0395
ke6yhx@w6ze.org

Treasurer:

Ken Konechy, W6HHC
(714) 348-1636
W6HHC@W6ZE.org

Membership:

Bob Eckweiler, AF6C
(714) 639-5074
af6c@w6ze.org

Activities:

Ron Mudry, W6WG
(714) 840-3613
w6wg@w6ze.org

Publicity:

Tom Cowart, W6ETC
(714) 454-0571
w6etc@w6ze.org

Technical:

Steven Belasco, N1BKB
n1bkb@w6ze.org

Directors @ Large

Dan Violette, KI6X
(714) 637- 4632
ki6x@w6ze.org

Tim Millard, N6TMT
(714) 744-8909
n6tmt@w6ze.org

2021 Club Appointments:**W6ZE Club License Trustee:**

Bob Eckweiler, AF6C
(714) 639-5074
af6c@w6ze.org

Club Historian(s):

Corey Miller, KE6YHX
(714) 639-5475
ke6yhx@w6ze.org

Bob Evans, WB6IXN (Emeritus)
(714) 543-9111
wb6ixn@w6ze.org

RF Editor for August 2021

Nicholas Haban, AF6CF
af6cf@w6ze.org

Webmaster:

Ken Konechy, W6HHC
(714) 348-1636
W6HHC@W6ZE.org

Assistant Webmaster:

Bob Eckweiler, AF6C
(714) 639-5074
af6c@w6ze.org

Tim Millard, N6TMT
(714) 744-8909
n6tmt@w6ze.org

ARRL Awards Appointees:

Arnie Shatz, N6HC
(714) 573-2965
N6HC@aol.com

John Schroeder, N6QQ
(West Orange Co.)
(562) 404-1112
N6QQ@msn.com

Monthly Events:**Membership Meetings***

Time: 7:00 PM
When: 3rd Friday of each Month
***See ZOOM announcement pg.1**

Board Meetings

First Saturday**each month 8 AM
New physical location coming soon
**** Board will handle Club business by ZOOM at this time**

Club Nets (Listen for W6ZE):

10M: 28.375 ± MHz SSB
Wed- 7:30 PM - 8:30 PM
Net Control: Corey, KE6YHX

2M: 146.55 MHz Simplex FM
Wed- 8:30 PM - 9:00 PM
Net Control: Corey, KE6YHX

75M 3.883 MHz LSB
Tue @ 8:00 PM (**UPDATED!**)
Net Control: Corey, KE6YHX



Wellness & Support Net
Tune into the following repeater:
CATALINA AMATEUR REPEATER ASSOCIATION (CARA)
147.090 MHz (+0.600 MHz) No PL

Monday - Friday
9:00AM and 9:00PM

Prg. Director. Tom W6ETC
NCO's include: Jeff: KK6TRC;
Don W6ZZW, Chris KF6LEX
John AJ6F; Milt N6MG;
Doug AD4AL; John KB6OVO

OCARC 2021 DUES

Membership period is:
1 January to 31 December

Individual New or Renewal:	\$30.
Family New or Renewal:	\$45.
Teen New or Renewal:	\$15.

New Member Dues are prorated quarterly and includes a badge:
Additional Badges: * \$3.
Use one of our interactive online forms to calculate current prices, join the club and/or order badges:

Online Forms / Dues & Badges

*\$3. plus mailing costs if applicable
Dues are subject to change without notice

OCARC GENERAL MEETING MINUTES 2021-07-16

Due to the continuing aftereffects of the pandemic, the seventh General Meeting of the year was via Zoom on Friday, July 16, 2021. The meeting was called to order by our president Nicholas Haban AF6CF at 7:01 PM PDT.

•Pledge of Allegiance

The meeting begins with our National Anthem for Independence Day this month.

•Meeting Presentation

Nicholas AF6CF turns the meeting over to our vice president, Tim Goeppinger N6GP, who introduces Wayne Overbeck N6NB, and XYL Carrie Tai W6TAI. Mr. Overbeck is a Media Law textbook author. He is co-inventor of the Quagi antenna, and was named Radio Amateur of the Year at the 1980 Dayton HamVention for this accomplishment. Mr. Overbeck has been winning VHF contests for over seven decades. He has helped the OCARC win Winter Field Day several years in a row. Fifty years ago this month, he had his camper mobile rig on the cover of QST. This year, Mr. Overbeck has featured on the cover of the May QST, "The Green Red Rover," which is tonight's presentation.

Wayne has presented to the OCARC several times over the years, and is glad to be here to present to us today. Credits go to Arnie Schatz N1HC and Steve Belasco N1BKB for the photo featured on QST. Wayne describes the history and many differences between gas and electric vehicles. Electric vehicles are now competitive with gas-powered vehicles.

Wayne and Carrie tell us of the tax credits, battery options, and the power configuration of electric vehicles now produced. Wayne describes the features and operation of his mobile rig in-depth. Wayne goes into some history, starting with Carrie's rover. It is an Infiniti with a 390-horsepower V8, and with this vehicle she was the first woman to come in first-place in a national VHF contest.

Going back, Wayne was a teacher years ago, first at a community college in 1965 with his new Master's Degree. He operated mobile rigs during his summers off work. Wayne operated in contests with many vehicles and rigs. Then he took time for publishing work, was elected Vice-Director of the ARRL Southwestern Division, retired, then came back to VHF contesting. He operated as a rover, won contests and set records from then-on. More info at N6NB.com.



Fig 1 – "Green Roving in a Red Rover"

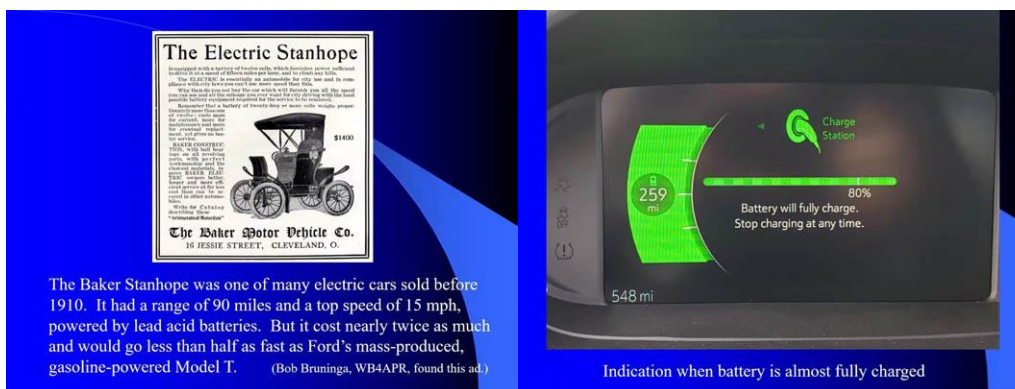
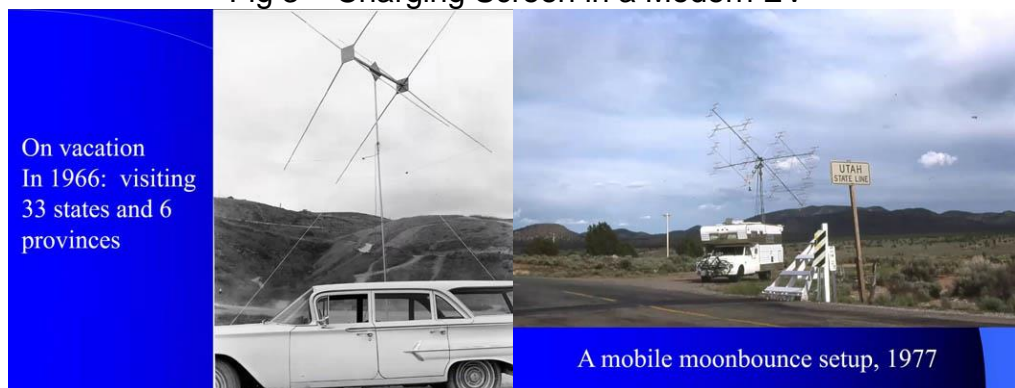


Fig 2 – The Baker Stanhope
Fig 3 – Charging Screen in a Modern EV



Figs 4 and 5 – On Vacation in 1966 and Mobile Moonbounce in 1977



Figs 6 and 7 – Wayne N6NB at LAX and Mount Equinox



Fig 8 – June, 2010: 10 Rover Stations, 15 Operators
Fig 9 – VHF+ Highlights of 63 years

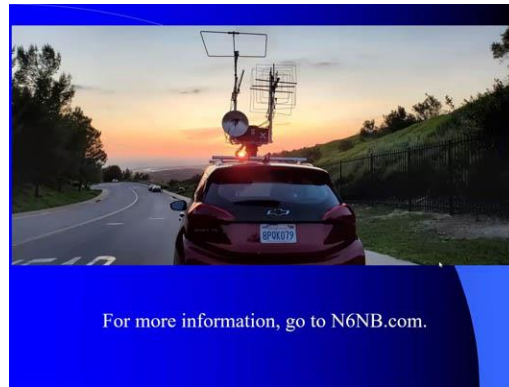


Fig 10 – Rover into the Sunset

•Questions and Answers

- Ron Cade W6ZQ asks Wayne about his contesting in West Virginia. Spruce Knob comes to mind.
- Mike KX6A asks how Wayne has fared with all the antennas and gear on the roof of his vehicles. Wayne turns it over to Carrie about how fast she goes in the Infiniti with gear on the roof. She says if the noise from the gear changes, there is a problem, and you are going too fast. Arnie N6HC fills-in, it is important to orient the length of longer elements hood-to-trunk, or aim it back when driving.
- Doug Britton W6FKX asks Wayne about a paragraph in QST. It is about radio noise level in electric cars. Wayne says some car manufacturers have given up on the 20dB to 30dB noise from regenerative braking on HF and AM radios.
- Tim G. N6GP asks about the maximum antenna height for mobile rigs. Wayne's rule-of-thumb is keeping the antenna height below twelve-feet while driving. State laws vary regarding this.
- Tim G. N6GP also asks the location of the QST cover photo. Steve N1BKB and Arnie N6HC say it was taken on Skyline Drive in North Tustin.

Tim G. N6GP extends a very appreciative thank you to Wayne N6NB and Carrie W6TAI. We are very impressed with their history, innovation and accomplishments.

Nicholas AF6CF says it was an excellent presentation, and is proud and fortunate to be a member of a club that has such illustrious members.

•Field Day 2021

Ron W6WG says we did very well and had a good turnout. The field we picked was excellent for our contest. Tim G. N6GP echoes that, and we had great participation with setup and teardown. We submitted a score of 11,220, and we thank all who participated.

Business Meeting

The Business Meeting was called to order by our president, Nicholas AF6CF at 8:17 PM PDT. Nine (9) Board members were present for a quorum. Ken W6HHC was absent. Five (5) topics were brought to the Board tonight, and one (1) motion carried, adjournment.

•Director Reports

-Secretary: Corey KE6YHX went to the post office box in Tustin, Friday, and there were three pieces of mail, including two junk mail, and one dues payment.

-Activities: Ron W6WG is starting to arrange our participation in the California QSO Party coming in the first weekend in October. The rules have changed with several new categories of bonus points. Ron is also arranging the Christmas Party for December.

-Technical: Steve N1BKB reports, a little over a week ago, Bob AF6C came to his QTH and they went over the silent key equipment, some of which was sold for a reasonable price. We have two other options to vend the equipment, says Nicholas. The SK radio equipment is all listed for sale on the www.w6ze.org web site, says Bob AF6C. Tom W6ETC points-out that some of it we may want to keep for member use.

-Membership: Bob AF6C reports we have 117 members, including a new member who joined with the dues payment received today.

•Good of the Club

Ron W6WG asks that members send face photos for a new member gallery on the web site.

•Opportunity Drawing

Nicholas AF6CF introduces the opportunity drawing, and the prize of a Kenwood HC-10 Clock provided from a silent key donation. The prizewinner is Arnie N6HC, who graciously donates it to a radio club student at a local school.

•Adjournment

A motion to adjourn was made, seconded and carried at 8:50 PM PDT.

--Respectfully submitted by Corey KE6YHX OCARC Secretary



W6ZE NETS

10M: 28.375 ± MHz SSB

Wed - 7:30 PM - 8:30 PM

Net Control: Corey, KE6YHX

2M: 146.55 MHz Simplex FM

Wed - 8:30 PM - 9:30 PM

Net Control: Corey, KE6YHX

75M: 3.883 MHz LSB

Tuesday – 8:00 PM – 9PM

Net Control: Corey, KE6YHX

OCARC BOARD MEETING MINUTES 2021-08-07

Due to the aftereffects of the pandemic, the eighth Board Meeting of the year was via Zoom on Saturday, August 7, 2021. The meeting was called to order by our president, Nicholas AF6CF at 8:13 AM PDT. Seven (7) directors were present for a quorum. Steve N1BKB and Bob AF6C joined the meeting later. Treasurer Ken W6HHC was absent. There were seventeen (17) topics brought to the Board this morning, and one (1) motion carried, adjournment.

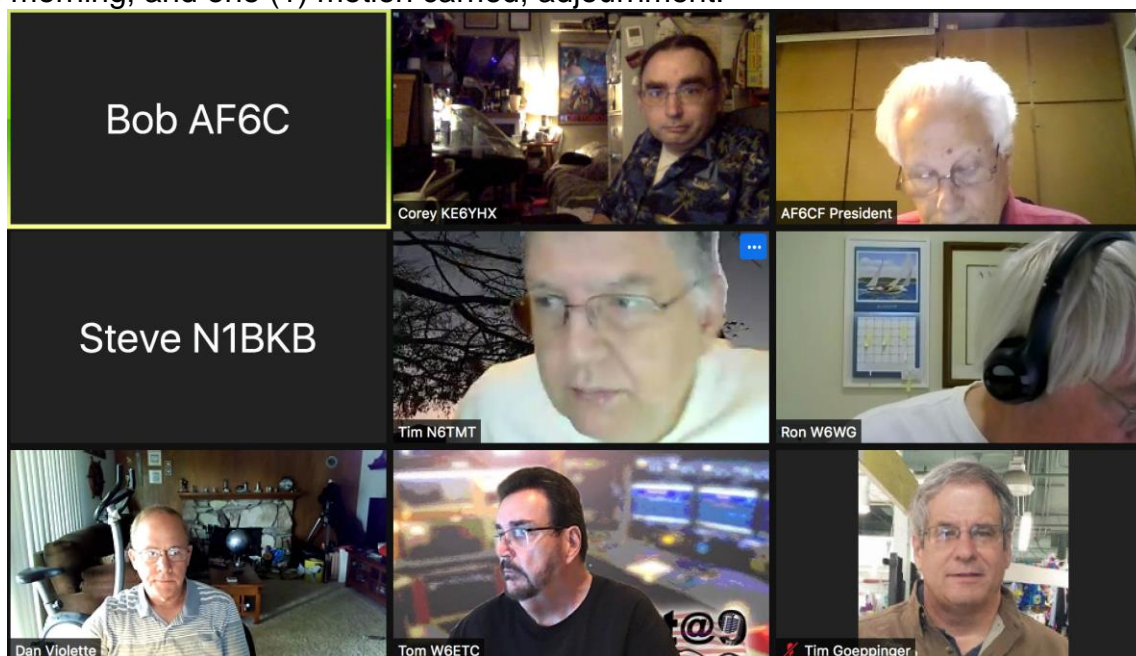


Fig 1 – Nine (9) Board Directors were present.

•Director Reports

-Treasurer: Ken W6HHC was absent, but his cash flow report was presented to the Board: Inflows total \$3,691, and outflows total \$1,866. They balance to a net increase of \$1,824. [See Page 27 details]

-Activities: Ron W6WG will be promoting the California QSO Party.

-Publicity: Tom W6ETC is working on our flyers for HRO.

-Technical: Steve N1BKB reports a new member needs help putting-up an antenna this coming month.

-Membership: Bob AF6C reports we now have 118 members, and the rosters are up-to-date.

-Director-at-Large 2: Tim M. N6TMT checked a restaurant prospect for the General Meetings, but Friday nights are busy for them. A different night may be chosen, says Nicholas.

-Historian: Corey KE6YHX reports, the club web site at www.w6ze.org for Thursday, July 22, 2021, has been backed-up to M-Disc. There are 8,567 files for an uncompressed size of 3.17GB, and a compressed size of 2.84GB (3.05GB decimal).

•Old Business**•Newsletter Editors:**

August: Nicholas AF6CF

September: Dan KI6X

October: Tim M. N6TMT

November: --open to volunteers--

December: --open to volunteers--

•General Meeting Programs:

August: Doug Millar K6JEY, "Receiver Optimization"

September: —lining-up—

October: Club Auction

November: Club Elections

December: Christmas Dinner

•Net Activity Report:

Since the July General Meeting, the eight (8) Nets together average 6.38 attendees.

•Club Web Site Status:

There are some possibilities for the front-page photo.

Steve N1BKB is working on a link and photo to our SK donations on our "For Sale" page for the QTH.com web site.

•SK Donations from Tegel, Boykin WB6KJJ, and others:

Nicholas AF6CF and Steve N1BKB are planning to take the SK donations to a vending site for sale.

•New Club Generator:

Nicholas AF6CF is working on the "Y"-connector system for perpetual propane use on our new Firman generator.

•Christmas Party:

Ron W6WG has us reserved at Mimi's for December 10, at 6:00 PM PST, for the Christmas Party. We have a \$300 minimum combined order, and a set menu.

•New Business**•New Activities for the Year:**

Ron W6WG is working on our California QSO Party participation.

Tom W6ETC suggests a park activity, but participation has been low for that type of activity in the past.

A Club VE program is something to be considered.

•October Club Auction – Old Generator:

The Board discusses options for the Club auction, including a parking lot auction or an online auction, or both. Tom W6ETC found a web site, biddingowl.com for the Board to consider. Ron W6WG will have Tim G. N6GP check with a parking lot location.

Bob AF6C will fix-up the old generator for sale. Nicholas AF6CF asks Bob to put it up for sale on our web site.

•Web Site:

The Board has been informed that the “New to Ham Radio?” page on our web site needs updating. This is discussed at-length and Tom W6ETC is asked to work on this.

The member photo page needs to be started, and Ron W6WG will work on this with Bob AF6C.

•Good of the Club

No items were presented for the Good of the Club.

•Adjournment

A motion to adjourn is made, seconded, and carried at 9:36 AM PDT.

--Respectfully submitted by Corey KE6YHX, OCARC Secretary

=====

A yellow rectangular box with a black border containing the text "RadioActivity" in a large, bold, black serif font, and "August 2021" in a smaller, bold, black serif font below it.

RadioActivity

August 2021

Upcoming Activities:**August**

- **ARRL 10 GHz and Up Contest:** 0600 Local Saturday August 21 through 2359 Local Sunday August 22.
- **North American QSO Party, SSB:** 1800 UTC Saturday August 21 through 0559 UTC Sunday August 22.
- **Run for the Bacon QRP Contest:** 2300 UTC Sunday August 15 to 0100 UTC Monday August 16.
- **W/VE Islands QSO Party:** 1200 UTC Saturday August 28 through 0300 UTC Sunday August 29.
- **World Wide Digi DX Contest:** 1200 UTC Saturday August 29 through 1200 UTC Sunday August 30.

September

- **WAE DX Contest, SSB:** 0000 UTC Saturday Sept. 11 through 2359 UTC Monday Sept.12.
- **ARRL September VHF Contest:** 1800 UTC Saturday August 11 through 0300 UTC Monday September 13.
- **North American Sprint, CW:** 0000 UTC to 0400 UTC Sunday September 13.
- **ARRL 10 GHz and Up Contest:** 0600 Local Saturday August 18 through 2359 Local Sunday August 19
- **North America Sprint, RTTY:** 0000 UTC through 0400 UTC Sunday Sept. 19.

* Indicates club entries are accepted

** Indicates team entries are accepted

Note: When submitting logs for ARRL Contests indicate your club affiliation as “Orange County ARC CA”

October

• California QSO Party

1600 UTC Oct. 3 through 2200 UTC Sunday Oct. 4.

Note: When submitting logs for CQP indicate your club affiliation as "Orange County ARC"

State QSO Parties:

- **Maryland-DC QSO Party:** 1400 UTC Saturday August 14 through 0400 UTC Sunday August 15.
- **Hawaii QSO Party:** 0400 UTC Saturday August 28 through 0400 UTC Monday August 30.
- **Ohio QSO Party:** 1600 UTC Saturday August 28 through 0400 UTC Sunday August 29.
- **[Kansas QSO Party:](#)** 1400 UTC Saturday August 28 through 0200 UTC Sunday August 29 and 1400 UTC through 2000 UTC August 30.
- **Colorado QSO Party:** 1300 UTC Saturday Sept. 4 through 0400 UTC Sunday Sept. 5.
- **Tennessee QSO Party:** 1800 UTC Sunday Sept. 5 through 0300 UTC Monday Sept. 6.
- **Alabama QSO Party:** 1500 UTC Saturday Sept. 11 through 0300 UTC Sunday Sept. 12.

Ongoing Activities:

- **Super QP Challenge:** Year Long Event
0000 UTC Jan. 1 to 2400 UTC Dec. 31.

Repeating Activities:

- **Phone Fray** Every Tuesday night at 0230Z to 0300Z
- **[SKCC](#)** Weekend Sprintathon (Straight Key CW) on the first weekend of the month after the 6TH of the month. 1200 Sat. to 2359Z Sunday.
- **[SKCC](#)** Sprint (Straight Key CW) 0000Z to 0200Z on the 4th Tuesday night (USA) of the month.
- **CWops** Every Wednesday 1300 UTC to 1400 UTC 1900 UTC to 2000 UTC and Thursday 0300 UTC to 0400 UTC
- **K1USN Slow Speed Test:** (CW, 20WPM Max.) Every Friday 2000 UTC to 2100 UTC
Every Sunday night at 0000 UTC to 0100 UTC Monday

OCARC Club Nets:

- **75 Meter Net:** Every Tuesday night at 8:00 pm to 8:30 pm Local Time. SSB 3.883 MHz
- **10 Meter Net:** Every Wednesday night at 7:30 pm to 8:30 pm Local Time. SSB 28.375 MHz
- **2 Meter Net:** Every Wednesday night at 8:30 pm to 9:30 pm Local Time. FM Simplex 146.55 MHz

Other Nets:

- **Net-AT-9:** Wellness & Support Monday thru Friday 9:00 am and 9:00 pm Local Time
147.090 MHz (+600 MHz) No PL

Send an email to Ron W6WG, w6wg@w6ze.org to have your favorite activity or your recent RadioActivity listed in next month's column.



Setting up an antenna is a Team Effort!



AMATEUR RADIO WELLNESS & SUPPORT

Catalina
Amateur Repeater Association
COME JOIN US

9 AM & 9 PM Monday – Friday on CARA Repeaters:
2M: 147.090 MHz (+0.600 MHz) No PL and
1.25M: 224.420 MHz (-1.600 MHz) PL 110.9 repeaters.
Also available on EchoLink node *CATALINA*



Attention Members!!!

Do you know a fellow ham that would be interested in joining OCARC? Do you have a friend that is curious about ham radio and wants to learn more about our hobby? Why not invite him or her to one of our exciting monthly meetings?!?! The meetings are fun, informative and entertaining. Check out the upcoming events page in this newsletter to see the exciting speakers we have lined up for the next couple of months. Don't forget about the great raffle prizes too. So bring a visitor to one of our meetings, and help **your** club expand!

Make sure to inform your friends of our club's website, which is always kept up to date. Information on club meetings, activities and our newsletter archive make it a worthwhile site to surf! <http://www.w6ze.org>





This month's speaker, Doug K6JEY, points to his source of inspiration...

Dr. Millar is used to operating with BIG antennas

He used this antenna to do some EME (Earth-Moon-Earth) communications in the past.



If you miss his 2021 August OCARC presentation, here is the YouTube link

<https://www.youtube.com/watch?v=xlc3bEmOjMY>



You don't need to write like William "Bill" Shakespeare in order to write an article for the RF Newsletter. In fact, we prefer articles without the words "Thy", "Whilst", "'Tis" and "Oft".

Do you have an idea for a newsletter article? Maybe you have acquired a new piece of equipment, designed or constructed a new antenna, took a trip focused around ham radio, want to share an amateur radio related experience or discuss a technical topic. Why not write an article for the monthly RF newsletter? The article can be short or long, simple or elaborate, and can even include pictures!

The RF newsletter relies on articles from our members. So why not give it try? Write an article and send it to the newsletter editor. It's fun, and at the same time, your contribution helps support our club and hobby!

Heathkit of the Month #108: by Bob Eckweiler, AF6C



ELECTRONIC TEST EQUIPMENT

Heathkit IP-2718 Tri-Power Supply

Introduction:

If you do any bench work with solid-state devices, a low-voltage power supply is a necessity. More likely, you'll want to have two or three handy. Voltages of 3.3, 3.6, 5, 12 and 15 volts are common for digital circuits. Analog circuits often require positive and negative voltages simultaneously - often ± 12 , ± 15 , ± 20 or occasionally $+15 / -5$ volts. A good solution is a multi-output power supply such as the Heathkit IP-2718 Tri-Power Supply, (Figure 1).

In HotM #94¹ the IP-27 Regulated Low-Voltage Power Supply was featured. It has a single output capable of 0.5 – 50 volts at up to 1.5 A. It can operate as either a constant voltage or constant current supply – a nice feature if you occasionally charge SLA² batteries. On the other hand, the Heathkit IP-2718 offers three totally separate power supplies in a single unit that takes up only about 80% of the workspace of the IP-27. Since the supplies are independent, they can be connected in series, and if properly done, even paralleled for more versatility.

Here is a link to the index of Heathkit of the Month (HotM) articles:

http://www.w6ze.org/Heathkit/Heathkit_Index.html

1. Notes begin on page 26



Figure 1: Heathkit IP-2718 Tri-Power Supply with three outputs of 5 V @ 1.5 A fixed, 0 - 20 V @0.5 A and a second 0 - 20 V @0.5 A. Photo: AF6C

The IP-2718 Tri-Power Supply:

Heathkit first introduced the IP-2718 in the Spring 1976 catalog with an announcement to “order now for shipment by April 26th 1976” (see **Figure 2**.) The IP-2718 initially sold for \$79.95. It was also available factory wired as the Heath SP-2718 for \$140.00. Heath sold numerous units to the government, and likely to schools too. You can still find the SP-2718 manual on a government manual repository site³. The kit and factory wired versions remained for sale into 1992, over sixteen years. In the 1992 (229-100) Heath catalog the IP/SP-2718 was listed at \$139.95/\$200.00, and marked “Limited Quantities”.

The IP-2718 Specifications:

Two of the three power supply outputs are variable between 0 and 20 VDC and each is capable of 500 mA maximum current. The third power supply is fixed at 5.0 volts and can supply 1.5 A. None of the power supplies are referenced to chassis ground, so they can each supply either a positive or negative voltage. A separate chassis-ground binding post is provided on the front panel. All outputs are current limited and protected.

The voltage and current for each of the three power supplies can be read on a large, flush mounted, meter with color-coded scales. Selection is by a six-position rotary **METER**

IP-2718 Tri-Output Experimenter Power Supply

\$79⁹⁵

Three floating outputs can be connected in any combination for a wide variety of output voltage and current capability

Combines 5 VDC fixed output with two 0-20 VDC variable outputs in a single, compact supply ideal for experimenters. The 0-20 variable outputs can be tracked — one will “follow” the other at any specified voltage difference — ideal for analog circuits requiring a + and — voltage. The 5-volt output is useful for digital circuits. All outputs are short-circuit proof, with current limiting. They can be operated independently, in series, or in parallel. Switchable front panel meter monitors all outputs.

Kit IP-2718, Shpg. wt. 12 lbs. **79.95**
 Assembled SP-2718, Shpg. wt. 12 lbs. **140.00**

IP-2718 SPECIFICATIONS

Outputs: 5 volts DC $\pm 5\%$ at 1.5 A. Two 0-20 VDC at 0.5A, continuously adjustable. Regulation: Load: less than 0.1% variation from no load to full load on 20-volt supplies; less than 2% variation from no load to full load on 5-volt supply. Line: less than 0.2% variation for line voltage change of 10 volts on 20 volt supplies; less than 0.15% variation for line voltage change of 10 volts on 5-volt supply. Power Requirement: 100-135 VAC or 200-270 VAC, 60/50 Hz, 100 watts full load. Dimensions: 4 1/2" H x 10 1/4" W x 9" D.

PLACE ORDERS FOR THESE PRODUCTS NOW FOR SHIPMENT BY APRIL 26, 1976.

New Offers 3 Output Voltages for Virtually Any Circuit Design



Kit or Assembled

Figure 2: Ad from the Spring 1976 catalog introducing IP-2718 and it's factory built brother the SP-2718.

switch, and the overall accuracy is spec'd at 5% of full-scale. The meter is not illuminated.

The two variable power supplies can be operated independently or put in “tracking” mode where a single control adjusts both voltages. This can be done with both power supplies being used at the same or opposite polarities.

The specifications of the IP 2718 are summed up in **Table I**.

The IP-2718 Front and Rear Panels:

The front panel controls are well laid-out and easy to use. They are summed up in **Table II**. There are no controls on the rear panel; just a Heyco strain relief for the permanently connected power cord (**Figure 3**). Two power transistors and an IC regulator are mounted on the back panel using it as a heat sink; all are TO-3 packages and insulated with a

plastic transistor insulating cover. On the bottom of the cabinet is a small opening allowing access to a slide switch that selects the line voltage -either 120 or 240 volts AC. The IP-2718 has a 3-wire polarized power cord and protection is via a 1.5 A 3AG fuse internally mounted in a fuse clip.



Figure 3: Rear view of the IP-2718 showing line cord and covers for the 5V IC regulator and two MJ2841 power transistors. Photo: AF6C

IP-2718 SPECIFICATIONS**Outputs:**

5-Volt Supply: 5 volts DC $\pm 5\%$ at 1.5 amps.

'A' Supply: 0 - 20 volts DC at 0-5 amps
continuously adjustable.

'B' Supply: (same as 'A' supply).

Regulation: ('A' and 'B' supply)

Load: Less than 0.1% (20 mV) variation
from no load to full load.

Line: Less than 0.2% (40 mV) for a line
voltage change of 10 volts.

Regulation: (5 volt supply)

Load: Less than 3% (150 mV) variation
no load to full load.

Line: Less than 0.2% (10 mV) for a line
voltage change of 10 volts.

Regulation: (both supplies)

Ripple & Noise: Less than 5 mV RMS.

Current Limiting: Limiting for each supply fixed
slightly above rated current to
provide short-circuit protection.

Tracking Range: 2 to 18 volts.

Tracking Error: Less than 1 volt.

Series Operation: All three supplies may be operated
in series.

Parallel Operation: 'A' and 'B' supplies may be operated
in parallel by adding 0.5 Ω current-
equalizing resistors (not supplied).

Meter Ranges: Voltages, 0 - 20 and 0 - 5.5
Current, 0 - 550 mA and 0 - 2 A

Meter Accuracy: 5% of full-scale.

Power Req'm't's: 100 - 135 VAC or 200 - 270 VAC
50/60 Hz, 100 watts at full load.

Fuse: 3AG 1 1/2 ampere

Dimensions: 4 1/2" high x 10 3/4" wide x 9" high.

Net Weight: 10 lbs. (3.73 kg).

Shipping Weight: 12 lbs. (5.45 kg).

(Data is mostly from the IP-2718 Assembly Manual.)

TABLE I**IP-2718 FRONT PANEL ITEMS****Row - Top Two thirds (Left -to-Right):**

Meter 0-1 mA 50 Ω movement (Mercer Electronics)

0 - 20 (Black scale) **0, 5, 10, 15, 20**

Tic marks each div. (total 21)

0 - 5.5 (Red scale) **0, 1, 2, 3, 4, 5, 5.5**

5 tic marks per div. (total 29)

METER: Switch 6PDT, rotary (from CCW)

5 V - AMPS 0 - 20 scale divided by 2

5 V - VOLTS 0 - 5.5 scale direct

B AMPS 0 - 5.5 scale divided by 10

B VOLTS 0 - 20 scale direct

B AMPS 0 - 5.5 scale divided by 10

B VOLTS 0 - 20 scale direct

VARIABLE OUTPUT VOLTAGE:

SUPPLY 'A' Potentiometer 10K Ω

SUPPLY 'B' (inner black knob) with...

'A' TRACKING 'B' (outer red knob)

Dual concentric 10 K Ω pots
with clutched coupling

INDEPENDENT ◀ ▶ TRACKING

DPDT Slide sw., centered below
potentiometer knobs.

Row - Bottom Third (Left -to-Right):

Pilot Lamp Neon, NE2H

POWER DPDT Slide Switch **OFF, ON**

\perp (Chassis) Binding post (Green)

5V 1.5 A

- Binding post (Black)

+ Binding post (Red)

0 - 20V .5 A

OUTPUT 'A'

- Binding post (Black)

+ Binding post (Red)

0 - 20V .5 A

OUTPUT 'B'

- Binding post (Black)

+ Binding post (Red)

(Bold items in table are printed nomenclature.)

TABLE II

The IP-2718 Operation:

The operation of the Tri-Supply is very simple. When the **POWER** slide switch is turned to **ON**, 5V is available at the **5V 1.5 A** binding posts. Since the supply is isolated you can obtain -5 volts by connecting the +5V binding post to your circuit common. Up to 1.5 amps may be drawn, and if that is exceeded the voltage will begin to drop, protecting the regulating IC⁴.

At the same time, voltage is available at the **0 - 20V .5 A OUTPUT 'A'** and **0 - 20V .5 A OUTPUT 'B'** binding posts. With the **MODE** slide-switch in the **INDEPENDENT** position, the OUTPUT 'A' voltage is controlled by the large black **SUPPLY 'A'** knob, and the OUTPUT 'B' voltage is controlled by the outer black concentric **SUPPLY 'B'** knob.

Separate Operation:

The three power supplies can be operated independently as a positive or negative supply. Any one of the two output terminals of each supply may be connected to the chassis terminal.

Tracking Operation:

With the **MODE** switch in the **TRACKING** position OUTPUT 'A' is controlled by the smaller red **'A' TRACKING 'B'** knob that is concentric with the SUPPLY 'B' knob. The concentric controls are clutched together. Turning one turns the other, though they can be moved separately. Thus you can adjust both supplies with one knob and the two will track, keeping whatever offset initially was established, if any.

Series Operation:

Two, or all three power supplies, can be connected in series to obtain voltages up to 25 V, 40 V or 45 V of either polarity. Common can be selected at any of the junctions by connecting that point to your circuit common.

This point can also be jumped to the supply's chassis ground (green binding post) if desired.

Parallel Operation:

The 'A' and 'B' power supplies can operate in parallel allowing the current to be increased to 1 ampere. To do this requires two 0.5 Ω resistors to be placed in series with each power supply. Heathkit does not supply these resistors with the instrument. Before making the connection the 'A' and 'B' power supplies should be set to the desired voltage. After the connection the voltages should be adjusted slightly so that each supply is drawing approximately the same current. These resistors help equalize the sharing of the current.

Metering:

The large meter can be switched to read the voltage or current of each of the three supplies. The meter has two scales:

A black 0 - 20 scale to read the 'A' and 'B' supply voltages and the 5 V current (reading the scale as 0 - 2 amperes.)

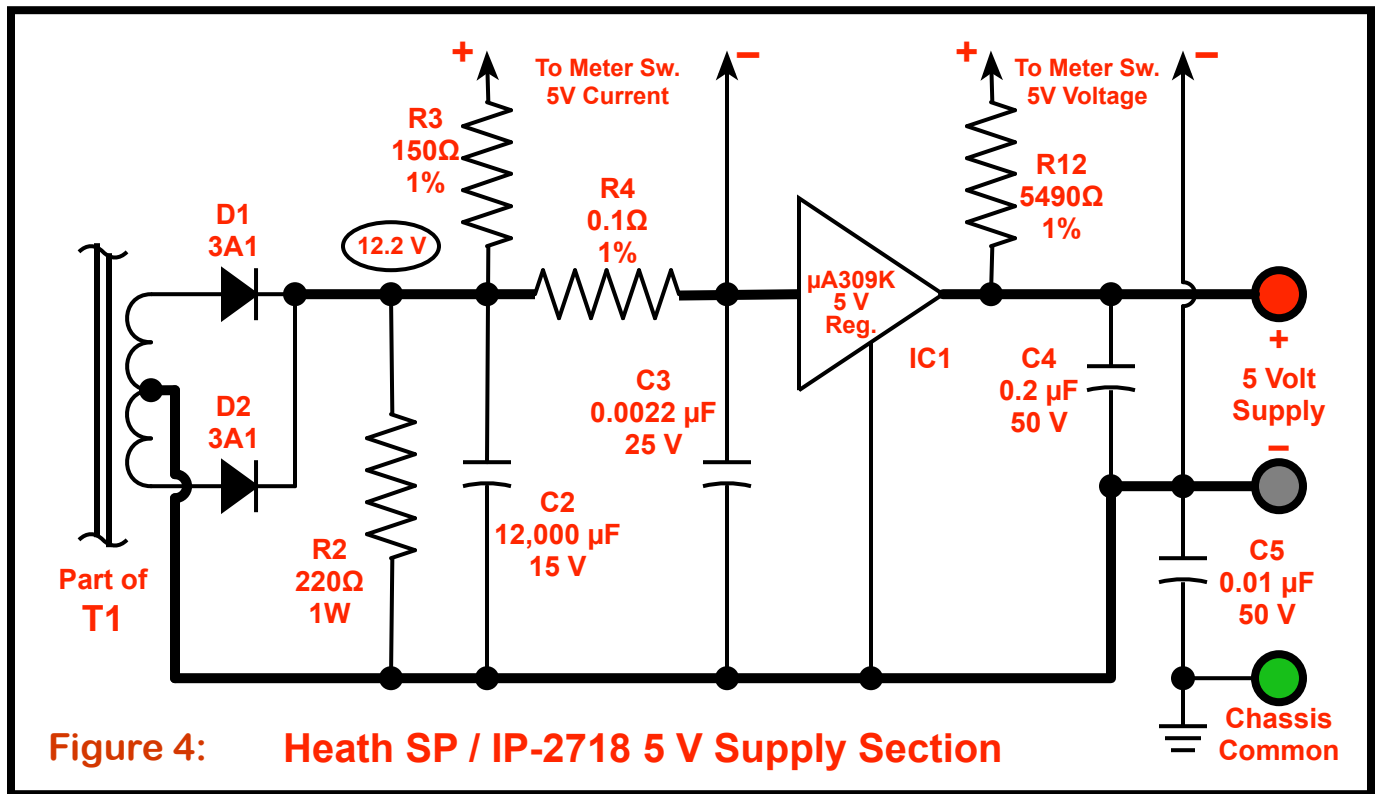
A red 0 - 5.5 scale to read the 5 V supply voltage and the 'A' and 'B' supply current (reading the scale as 0 - 0.55 amperes.)

The IP-2718 Circuits:

A full schematic of the IP-2718 is available on the web and should be referenced while reading this discussion.⁵

5 V, 1.5 A Supply

A simplified circuit of the 5 V power supply is shown in **Figure 4**. An 18 volt center-tapped winding feeds a full wave rectifier (D1 and D2) followed by C2 a 12,000 μ F electrolytic filtering capacitor. The resulting 12.2 volts is fed to IC1, an LM309 5V regulator chip. This integrated circuit was the first of the three terminal voltage regulators used in



so many simple power supplies. R2 provides bleed current, C3 prevents instability in the LM309 IC; and C4 lowers the output impedance at high frequencies.

The voltage is monitored across the output terminals by the one mA meter. For a full scale reading of 5.5 volts on the red meter scale, the series resistance to the meter should be 5,500 Ω . Since the meter has an internal resistance of 50 Ω , the series resistor should be 5,450 Ω . The closest 1% value is 5490 Ω , which is the value of R12. Any error is insignificant.

The current is monitored across R4, a 0.1 Ω resistor. Assume 2 amperes is flowing through R4; that develops 0.2 volts across R4. The meter, in series with R3, a 150 Ω resistor, is across R4 - a total of 200 Ω . thus when 2 amperes are drawn through R4 1 mA will flow through R3 and the meter resulting in a full-scale reading on the 0 - 20 black

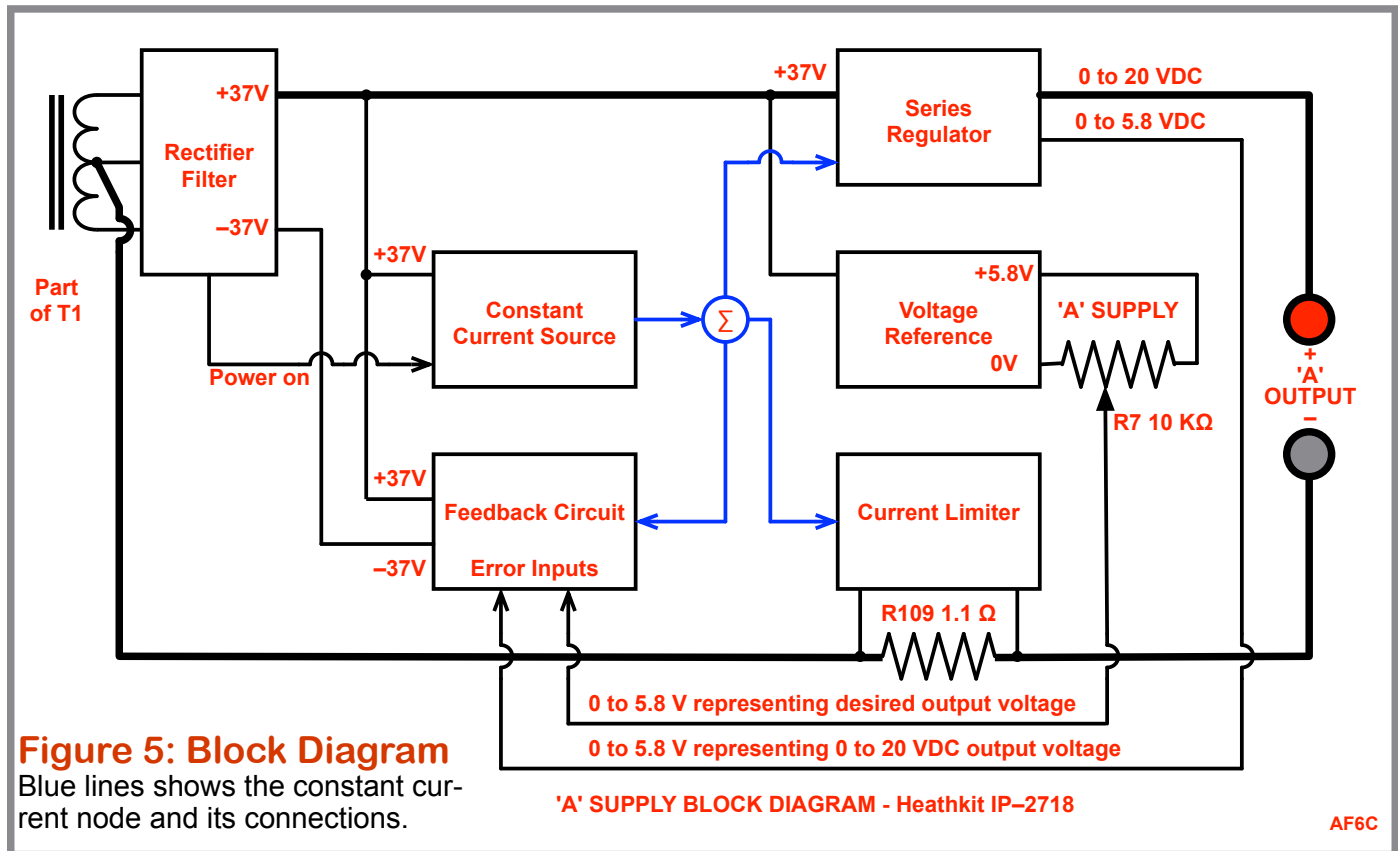
scale. There is a slight inaccuracy due to the quiescent current used in the chip, but again this error is insignificant.

0-20 Volt Supplies 'A' and 'B'

The 'A' and 'B' supplies are a lot more complex than the 5 V supply. The two supplies are almost identical so only the 'A' supply will be discussed. On the main schematic the components for the 'A' supply that mount on the circuit board are numbered in the 100's (such as R105, C103 etc.) while the components for the 'B' supply are numbered in the 200's. Parts that mount to the chassis for each have numbers below 100. The major difference between the 'A' and 'B' supplies is that, in the TRACKING mode, control of the power supply is switched from R7, the black 'A'. Supply knob to the concentric small red 'A' Tracking 'B' knob (R8).

'A' SUPPLY Block Diagram:

Figure 5 is a block diagram of the 'A' Supply. Here are the major blocks and their functions:



- **The Rectifier Filter** provides ± 37 VDC. It also supplies a power on signal to assure the constant current source runs during startup and through shutdown.
- **The Series Regulator** sets the output voltage depending on the current it is receiving. It also provides a voltage 0.29 times the actual output voltage to the feedback circuit.
- **The Voltage Reference** provides a stable adjustable voltage that is 0.29 times the desired output voltage. R7 is the front panel control that sets the 'A' supply.
- **The Constant Current Source** provides a stable current (~ 2.7 mA) to drive the series regulator, setting the output voltage.
- **The Feedback Circuit** compares the difference between the actual voltage and the desired voltage, and draws current from the constant current node to control

the series regulator and make these voltages equal.

- **The Current Limiter** monitors the negative current flow via R109. Should the current exceed $\frac{1}{2}$ ampere, the current limiter heavily draws current from the current source to reduce output voltage and protect the series regulator. Under normal operation it draws no current.

A Closer Look at the 'A' Supply Circuit:

For those interested, here is a breakdown of the blocks of the circuit, each with a more detailed description:

The Rectifier Filter (Figure 6A):

The 'A' Supply receives its power from a 58 VCT winding on the power transformer. It is full-wave center-tap rectified by diodes D101 and D102. From that point a power on signal is fed to the constant current circuit (to be

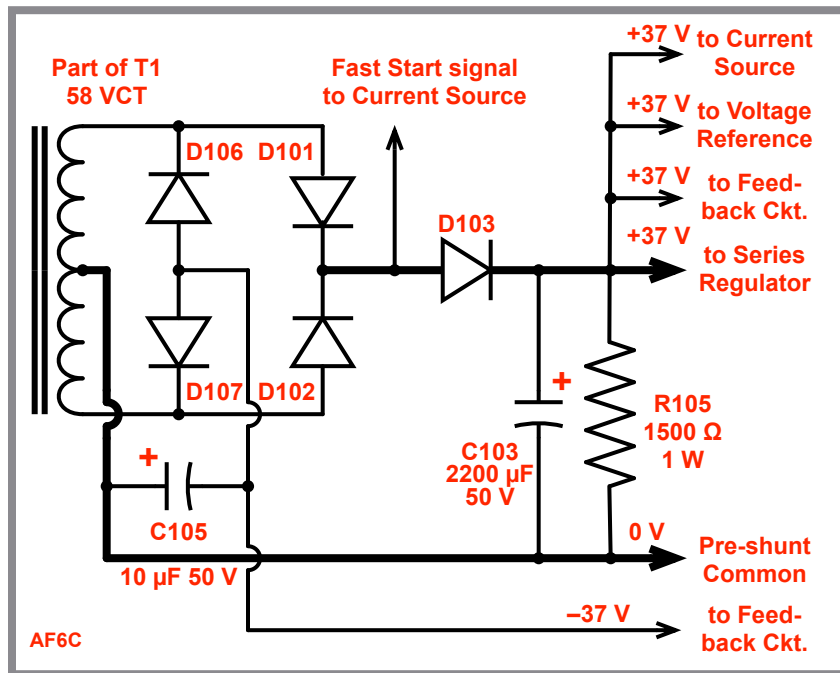


Figure 6A: The Rectifier - Filter circuit with power distribution.

discussed later). The voltage is also fed through an isolation diode D103 and filtered by C103. Resistor R106 bleeds off the charge on C103 when the unit is turned off. The resulting +37 VDC supplies power to the series regulator, the constant current generator, the reference voltage source, and positive voltage to the feedback circuit.

A second pair of diodes, D106 and D107, connected to the 58VCT winding, along with C-105 provides a negative 37 VDC to the feedback amplifier.

Series Regulator (Figure 6B):

Q1, an NPN power transistor is the main series regulator that controls the output voltage. To increase its gain, Q103 is wired to Q1 as a Darlington pair. The 47Ω resistor, R5 adds temperature compensation for Q1 at high temperatures. The voltage at the emitter of Q1 is controlled by its

base current. The output voltage appears across output terminals of the 'A' Supply and across voltage divider R123 and R124. The output of the voltage divider is about 0.29 times the actual voltage (At 20 V the divider output is 5.8 volts.) This voltage is sent to the feedback circuit.

Constant Current Generator (Fig. 6C):

To prevent transients while powering the IP-2718 up and down, it is important that the constant current generator and feedback amplifier are operating before the main filter capacitor fully charges, and remain powered through power down. Upon power up a 'fast start' signal, isolat-

ed by D103, turns on Q101. Upon power down Q101 remains on while C105 discharges.

When Q101 is conducting ZD104, C102, R102, R104 and Q102 act as a constant current generator; current is drawn through

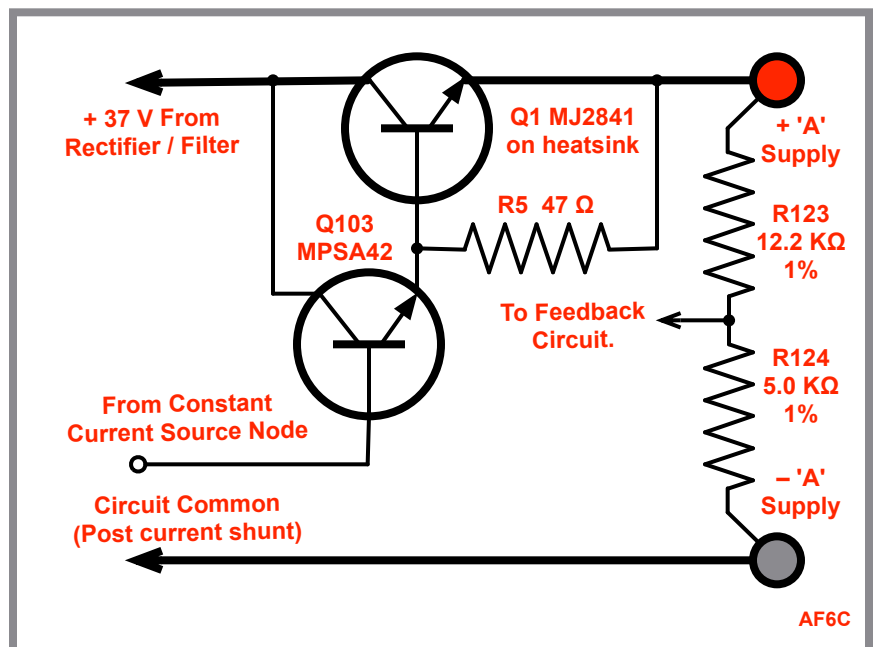


Figure 6B: The Series Regulator Circuit

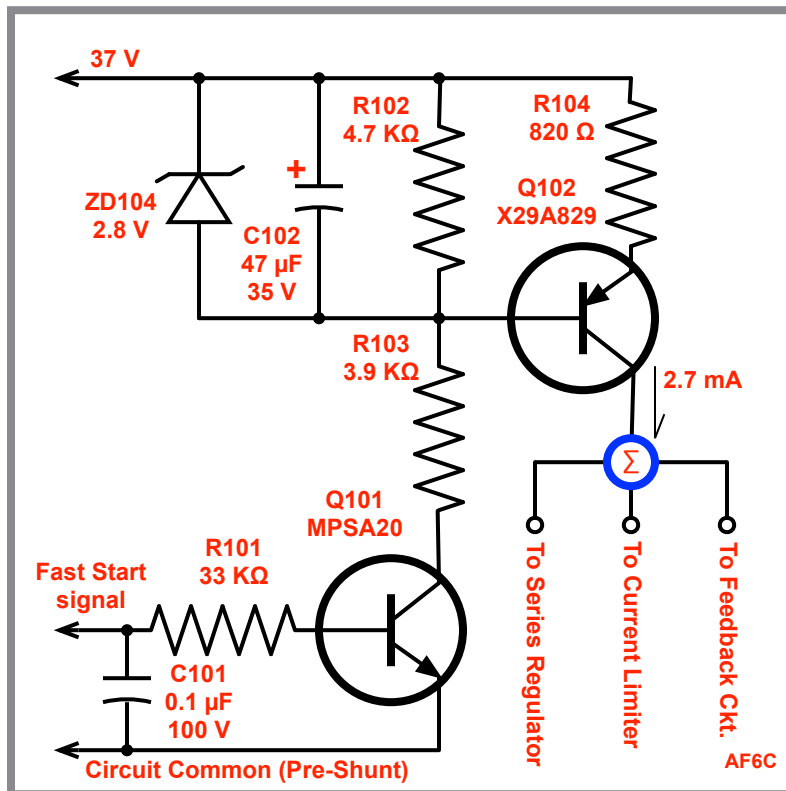


Figure 6C: The Constant Current Source Circuit

ZD104, a 2.8 volt zener. This causes 2.2 volts to drop across R104 resulting in an emitter current of about 2.7 mA. The large current gain (beta) of Q102 assures that the collector current is virtually the same as the emitter current. The resulting collector current is around 2.7 mA. This constant current has three paths it can travel. The first is to the series regulator transistors Q103 and Q1. The more base current Q103 gets the higher the output voltage. Path two is the feedback circuit, and path three is to the current limiting circuit.

The junction of these three paths is called a **Current Node**. 2.7 mA is being delivered to this node by Q102. The current is being fed to

the series regulator, and the 2.7 mA is enough to drive it to output more than 20 volts. However, not all the current gets there as the feedback circuit draws from the node to reduce the output to the voltage determined by the reference source (discussed next). Should too much current be drawn from the power supply, the current limiter can also heavily draw current from the node to protect the series regulator.

Reference Source (Figure 6C):

R106 and ZD108 pre-regulate the +37 volt supply down to 12 volts. A second zener regulator (R115 and ZD109) further regulate the voltage down to 6.8 volts. This well regulated voltage is divided down further by R116 and R117. R116 is the 'A' supply calibration pot and is set so the 'A' supply puts out 20.0 volts when the front panel 'A' OUTPUT VOLTAGE control R7 is fully

clockwise. This corresponds to about 5.8 volts at the wiper of R116. Thus, R7 outputs 0 – 5.8 volts over its range. This is the voltage reference that sets the desired output voltage.

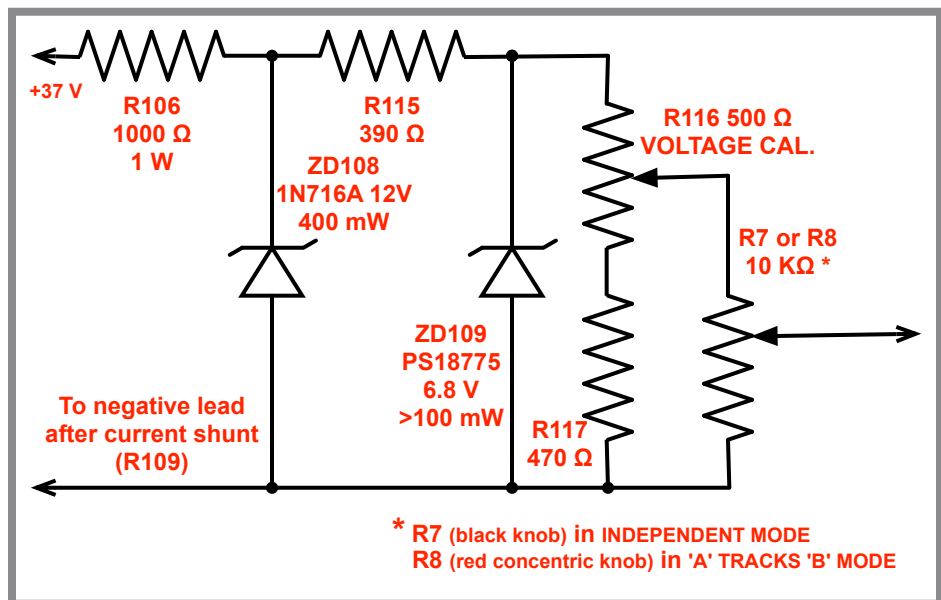


Figure 6D: The Voltage Reference Source Circuit

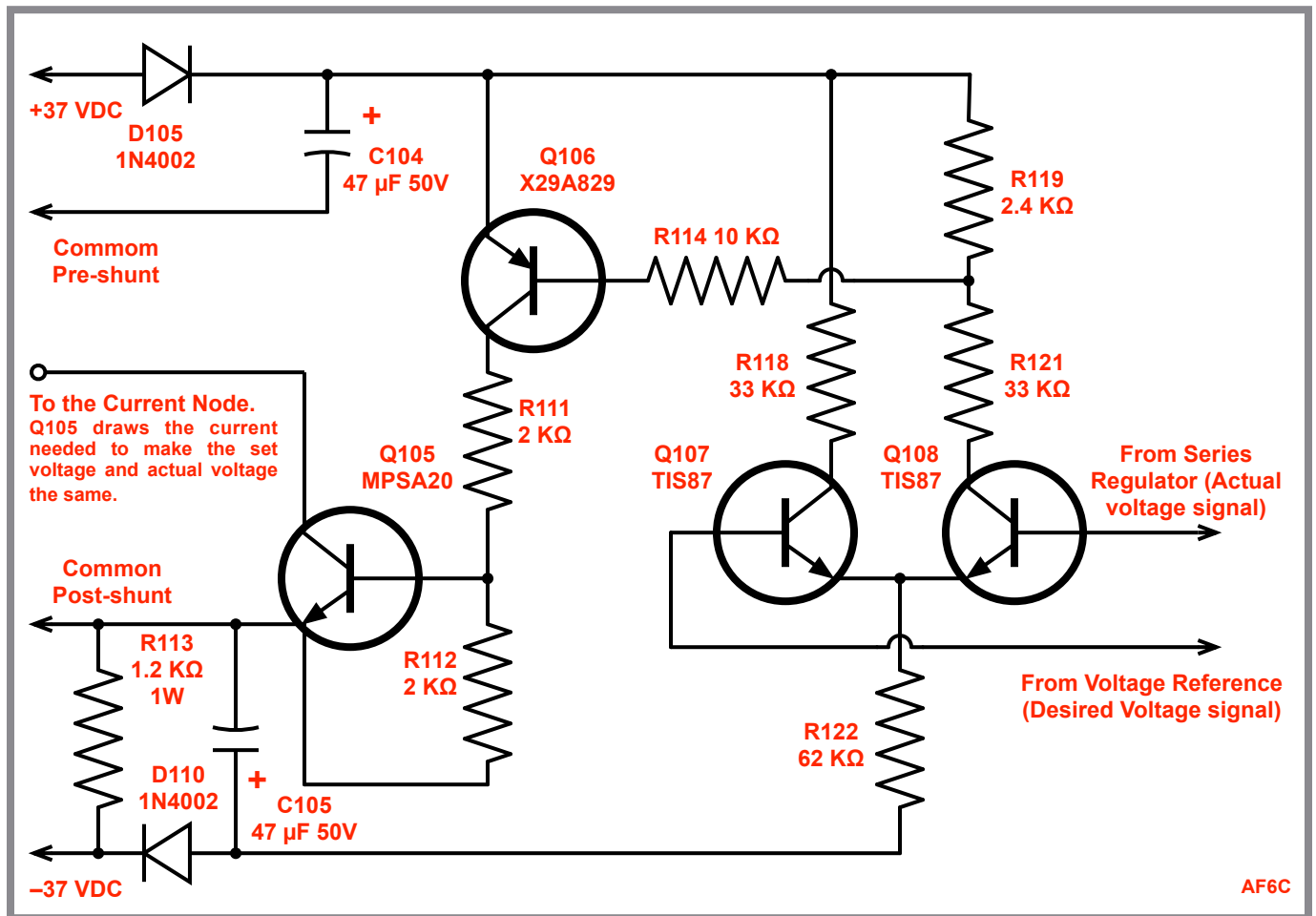


Figure 6E: The Feedback Circuit

Feedback Circuit (Figure 6E):

The feedback circuit consists of an error amplifier (Q107 and Q108), a buffer Q106 and the feedback amplifier Q105. Power for this circuit comes from the plus and minus 37 volt power supplies. D105 with C104 and D110 with C108 isolate the plus and minus power from the main power respectively; the capacitors keep the feedback circuit operational during the shutdown period to prevent transients.

Q107 and Q108 form a differential amplifier. The base of Q107 varies between 0 and +5.8 volts depending on the setting of the front panel 'A' OUTPUT VOLTAGE control, and the base of Q108 varies between 0 and +5.8 volts depending on the actual 0 – 20 volts being

output. The emitters are common and range between +5.1 to –0.6. The 62 KΩ emitter resistor ties the emitters to minus 37.5 volts. Thus a fairly constant current of about 0.65 mA flows through the emitter resistor. When the base voltages are equal, the emitter currents, and thus the collector currents, are equal. An error voltage is taken from across R119 that varies with the difference between the two base voltages. It is amplified by Q106 and drives Q105. Responding to the error voltage, Q105 draws more or less current from the current node, allowing more or less current to reach the series regulator base and correcting the output voltage to be the same as the reference setting.

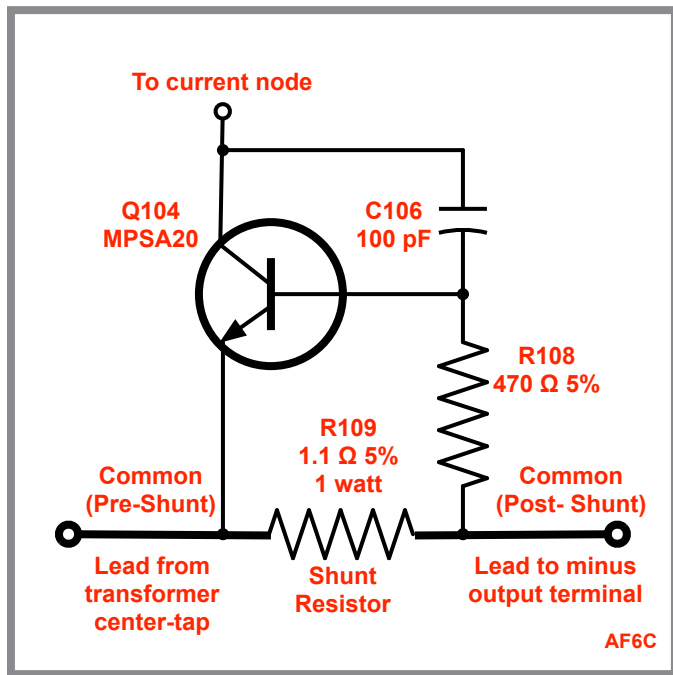


Figure 6F: The Current Limiting Circuit

Current Limiting (Figure 6F):

The current limiting circuit consists mainly of R108, R109 and Q104. Q104 is fully off during normal operation. Shunt resistor R109 (1.1Ω) is located in the main negative path of the voltage output. A voltage drop occurs across this resistor proportional to the current being drawn from the 'A' supply. Should this draw become greater than one-half ampere, the voltage drop across R109 will cause Q104 to start to conduct, drawing heavily from the current node, reducing the current available to the series regulator and causing output the voltage to drop. The feedback circuit will try to correct the voltage drop but will soon run out of available current as the Q104 can easily absorb the full 2.7 mA from the current node, shutting the power supply down indefinitely without damage, or until the over current condition is removed.

Pre-Shunt / Post-Shunt Circuit Common:

One may have noticed, looking at the partial schematics, that circuit 'common' is referred

to as pre-shunt and post-shunt. The circuit common starts at the center-tap of the 58V transformer winding and extends to the negative output terminal for the power supply. In the path is a 1.1Ω resistor R109. This resistor is instrumental in measuring the output current for meter indication as well as current limiting. There is a small voltage developed across this resistor. Internal circuits use the common on the side of the shunt resistor that least creates output errors.

'A' Supply Metering:

When the METER switch is set to 'A' VOLTS, the meter is placed in series with a 19.9 KΩ 1% precision resistor (R13) between the output and post-shunt common. At 20 volts the current flowing through the meter is: $20 \text{ V} / (19.950 \text{ K}\Omega)$ or, with negligible error, 1 mA – causing full scale meter movement on the black 0 – 20 scale.

When the METER switch is set to 'A' AMPS, the meter, in series with a 555 Ω 1% resistor (R107), is placed across the shunt resistor R109. Should 0.55 amperes flow thru R109, the voltage drop across it is 0.605 volts, and the current flowing through the meter is: $0.605 \text{ V} / (605 \Omega)$ or 1 mA, – causing full scale meter movement on the red 0 – 5.5 scale.

Heathkit IP-2718 Calibration:

After successfully completing the published resistance and voltage checks, calibration can be done. Calibration consists of first mechanically zeroing the meter, and then, with the three voltage controls set to full clockwise and the MODE switch in the TRACKING position, internal control R216 ('B' SUPPLY) then control R116 ('A' SUPPLY) are adjusted for 20 volts output on the meter. Finally, the MODE switch is switched to INDEPENDENT and the 'A' SUPPLY voltage checked to be sure it reads $20 \text{ V} \pm 1 \text{ V}$.

Using the Heathkit IP-2718 Tri-Supply:

The author's Tri-Supply was purchased from a ham's estate. A quick look at the unit showed it to be in good shape, though in need of a cleaning. It powered on and immediately it was noted that the voltage setting potentiometers were in need of cleaning. It was also noted that in the TRACKING mode the voltages did not follow well.

The tracking circuit is not rocket science and it is assumed the problem is that the two sections of the dual concentric, clutched potentiometer do not follow each other within the specified tolerance. The pot will be taken out and checked. Finding a replacement may be a problem as the pot is not used in any other Heathkit (Heath Part #12-156). Still, the tracking feature is not that critical and can still be used with limited functionality.

Replacement of the electrolytic capacitors was not attempted, as all checked good. No twist-lock can capacitors are used so replacements should be easy to find. Axial lead capacitors are becoming more difficult to find at reasonable prices, though JustRadio⁶ still carries a good selection at fair prices.

Heathkit IP-2718 Tri-Supply Assembly:

Most of the circuitry used in the IP-2718 mounts on a single circuit board located vertically near right side. The parts layout is open, making assembly easy.

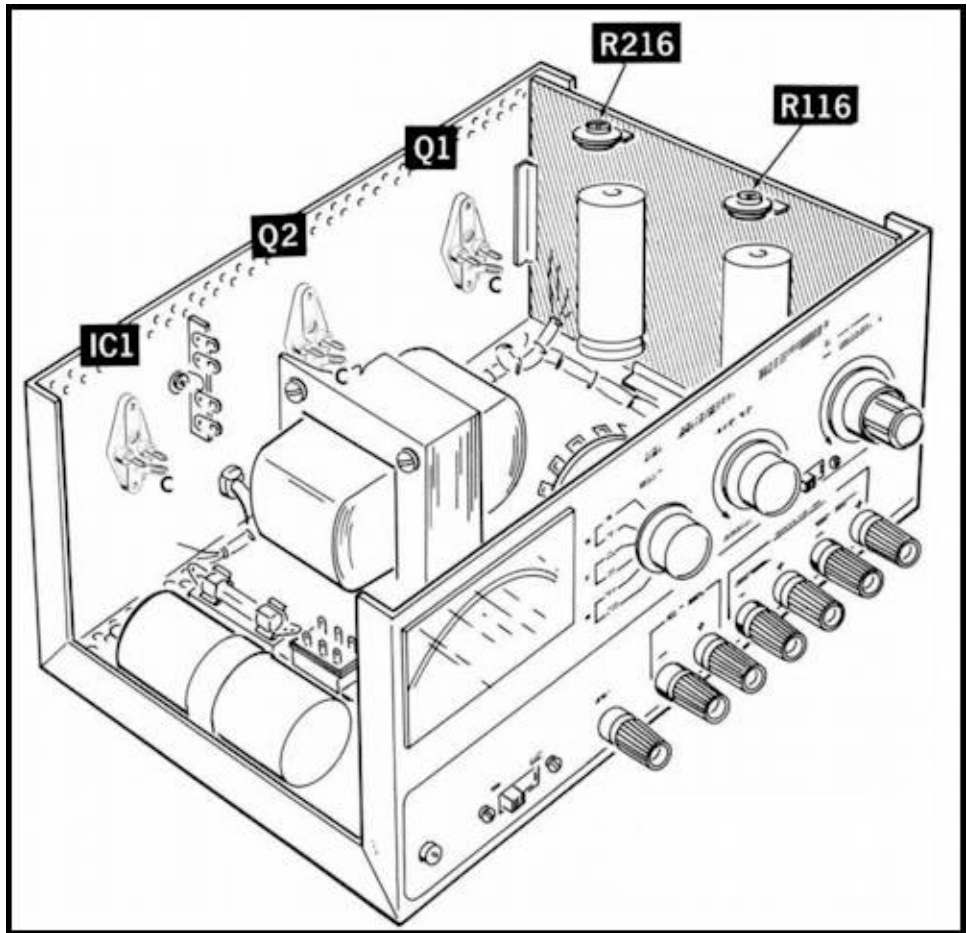


Figure 7: Internal drawing of the IP-2718 showing the major parts placement. Circuit board mounts vertically on right side. (Heath drawing)

Figure 7, a drawing from the IP-2718 Illustration Booklet, shows the location of the various parts. Note that IC1, Q1 and Q2 mount on the rear panel, and use the panel as a heat sink. The two calibration controls R116 and R216 are mounted on the circuit board and are easily accessible when the cover is removed.

Author Ramblings:

I often check the heathkit.com website to see if there is anything new on the horizon. Earlier this year I saw they have stopped taking pre-orders for their HM-1002 Precision RF Meter, announcing ***“Presently no further pre-orders are being taken until initial First Production Run deliveries are complete.”***

The kit, while expensive, is a bargain if it

does all it is supposed to do. The surprise is that they took on such a high-end project for their first real amateur radio kit.

Last Christmas I came very close to ordering their “Most Reliable Clock”, though why I need another digital clock I can’t figure. Maybe I was just anticipating the adrenalin rush of putting together a new Heathkit after thirty some-odd years. When I saw the price had increased from \$100 to \$125 I hesitated and then never got around to ordering. I actually had planned to send a second one as a gift to one of my relatives. The kit would make a good article for this column so maybe I’ll try again this fall.

73, from AF6C



Notes:

1. http://www.w6ze.org/Heathkit/Heathkit_094_IP27%20LVPS.pdf
2. “SLA” Sealed Lead Acid battery (Gel-Cell)
3. http://cweb2.loc.gov/master/mbrs/recording_preservation/manuals/Heath%20Zenith%20Tri-Power%20Supply%20Model%20SP-2718.pdf
4. The current limiting point is also determined by the ambient temperature. It may not be possible to draw a full 1.5 A in hot ambient situations.
5. <http://www.w6ze.org/Heathkit/Sch/IP2718-Sch.jpg>
6. <https://www.justradios.com>

Remember, if you are getting rid of any old Heathkit Manuals or Catalogs, please pass them along to me for my research.

This article is Copyright 2021 R. Eckweiler, AF6C and The OCARC Inc.

Thanks - AF6C



Figure 8: A larger front view of the Heathkit Tri-Power Supply IP-2718.

OCARC Cash Flow - Year to Date

1/1/2021 through 7/24/2021

Category	1/1/2021- 7/24/2021
INFLOWS	
2021 SK Special Disposal Effort (Net)	251.00
Badge Income	1.64
Donation -new FD Generator	500.00
Dues, Family (PayPal)	129.50
Dues, Membership	450.00
Dues, Membership (PayPal)	1,651.27
Dues, Membership (Paypal) 2022	57.66
Sale Of Equipment	650.00
TOTAL INFLOWS	3,691.07
OUTFLOWS	
Field Day Rental - Tent	200.00
Generator - new Firman	915.87
OCARC Historian	97.91
PayPal Fee	1.75
PO Box Rental	118.00
Storage of Equipment - Ann Millard	250.00
Web Site Hosting - PayPal	133.00
ZOOM subscription	149.90
TOTAL OUTFLOWS	1,866.43
OVERALL TOTAL	1,824.64

ASSETS:

Wells Fargo Checking	\$6,664.44
PayPal account	\$26.25

MiniTiouner-Express

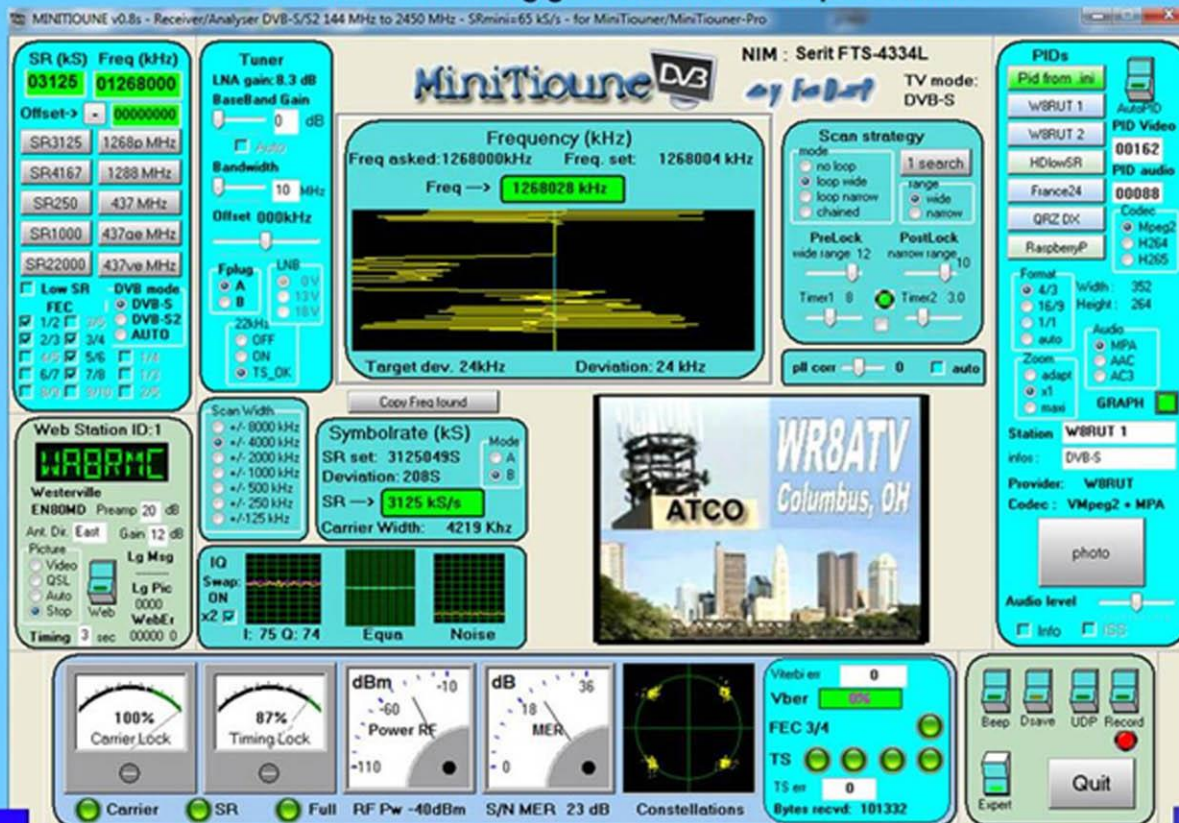
Digital Amateur Television DVB-S/S2 Receiver / Analyzer



Available at DATV-Express.com

- Operates with Windows PC using free MiniTioune software from Jean-Pierre F6DZP
- Smaller than a stack of 2 decks of cards (picture above is full size)
- Two independent simultaneous RF inputs with internal preamps
- High sensitivity -100dBm @1288MHz – at 1/2 FEC
- Fully assembled/tested in aluminum enclosure
- Covers 144-2420MHz (ideal for Space Station DATV reception)
- Symbol rates from 75 KSymB/s to >20 MSymbols/sec
- Uses external 8-24VDC supply or +5V from USB-3 port (with small modification)
- Real time signal modulation constellation & dBm signal strength display
- Price: US \$75 + shipping – order with PayPal

For details & ordering go to www.DATV-Express.com



(MiniTioune display above is the ATCO 1268MHz DVB-S repeater signal at WA8RMC QTH 15 miles away).