Barry Muhlfelder
May 30, 1997
Procedure P0155 Rev -

Science Mission Output Transformer (#25432-201) Fabrication & Acceptance Testing Procedure

Document Revision Record

Rev	Date	ECO No.	Pages Affected	Description
-	7/25/97	NA	All	new procedure

Materials & Supplies

1. Cores # 55145-A2 275V
2. Primary Wire: Belden 9975, 36 HPN natural
3. Secondary Wire: Belden 50119, 36 HPN blue
4. Solder # 60/40 Rosin Core
5. Resistance Wire: Platinum 8% Tungsten 4.1 mil OD
6. Keithley micro-ohm meter
7. Alcohol #2-Propanol
8. Clean room wipes # Durx 670
9. Fluke 77 Meter
10. HP 4277A LCZ Meter
11. Makita hand drill # 6012 HD 1100/400 RPM
12. Bausch & Lomb Microscope # 200m range 0.7x- 3.0x
13. Gloves Baxter Pharmaseal # 8857
14. Keithley 580 Micro-Ohmmerter
15. Acalpels (Surgical Blade) #371610
16. Insulated Bucket with at least 6" of liquid nitrogen
17. Liquid helium dewar
18. Vacuum pump with helium backfill plumbing
19. Bicycle stand
20. 1" VCR Gaskets
21. Small Plastic Bag

Authorized Personnel
M. Bogan
R. Shile
M. Luo

Note: This part is electric current sensitive. Use appropriate precautions.

Procedure
1.1 Send cores to Wirewinders per drawing 25432-201 Rev A.

1.2 Receive wound transformers from Wirewinders.

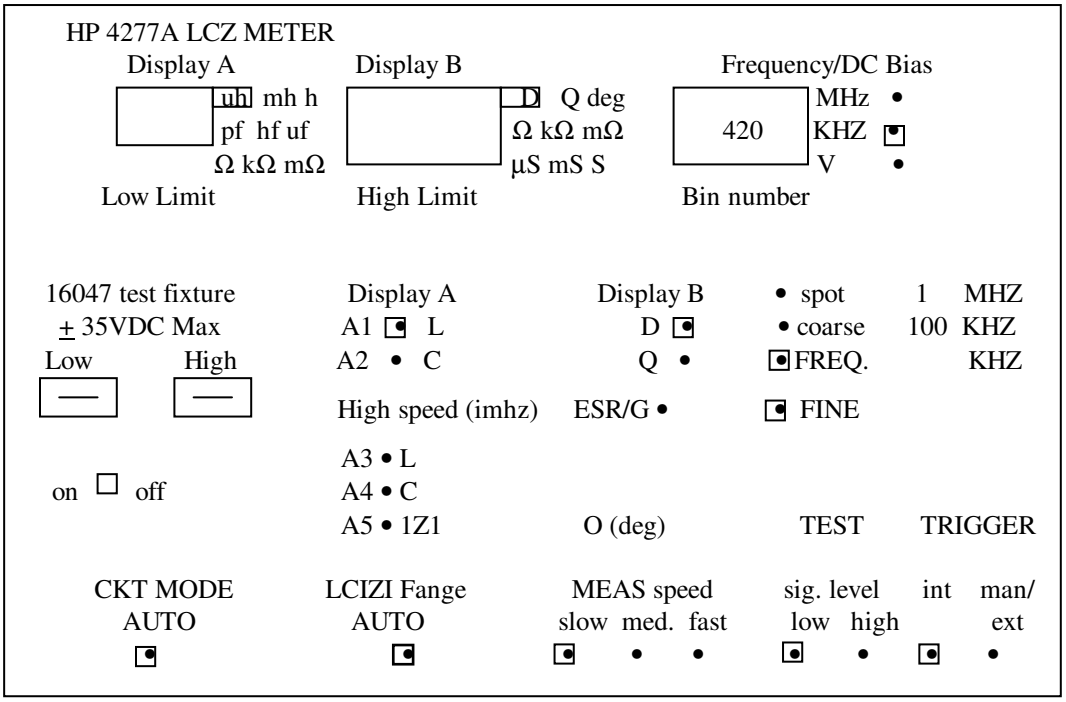
1.3 Visually inspect the transformers using the microscope. Check for any cracks or damage to the core, kinked wire or bare spots in wire insulation. Reject transformers with defects.

2.0 Measurement of transformer inductances and thermal cycling of transformer.
2.1 Turn on the LCZ meter. Allow at least 30 minutes warm up prior to making measurements.

Set up the LCZ meter as follows:
CKT MODE in AUTO
LC|Z| RANGE in AUTO
TEST SIGNAL in LOW
DISPLAY in L
FREQ at 420 KHz

See Figure 1 below for additional LCZ setup information.

Figure 1



2.2 Connect the Primary leads of the transformer to be tested to the input terminals of the LCZ meter. Measure and record in Table P0155-1 the inductance of the transformer primary.

2.3 Remove one of the primary leads from the LCZ meter and connect one of the secondary end leads in its place. Solder the free primary and secondary end leads together. Measure resulting series inductance and record in Table P0155-1 under Primary-Secondary Series Inductance A.

2.4 Unsolder the previously connected primary and secondary end leads. Disconnect the other secondary end lead from the LCZ meter and connect the secondary end lead that was previously connected to the primary to the LCZ meter. Solder the secondary end lead that that was previously connected to the LCZ meter to the free primary lead. Measure resulting series inductance and record in Table P0155-1 under Primary-Secondary Series Inductance B.

2.5 Divide the difference between the preceding two measurements by 4 and record in Table P0155-1 that value as mutual inductance.

2.6 Unsolder the previously connected primary and secondary end leads. Remove the primary lead from the LCZ meter. Connect the now free secondary end lead to the free terminal of the LCZ meter. Measure and record in Table P0155-1 the inductance of the transformer secondary.

2.7 Remove one of the secondary end leads from the LCZ meter and connect the secondary center tap lead in its place. Measure and record in Table P0155-1 under Secondary Leg 1 the resulting inductance.

2.9 Remove the secondary end lead from the LCZ meter and connect the other secondary end lead in its place. Measure and record in Table P0155-1 under Secondary Leg 2 the resulting inductance.

2.10 Place the transformer in SQUID Carrier Temperature cycling Probe and seal the probe using a new VCR washer.

2.11 Connect probe Swagelok fitting to the pumping port on the pumping station using the 3' plastic tube. Connect the Swagelok nut on the 7' length of plastic tube to the back fill port of the pumping station.

2.12 Open the helium cylinder valve and set the regulator at 1 - 2 psig. Insert the free end of the 1/4" OD plastic tube coming from the backfill port into the 1/4" ID tube going to the helium cylinder.

2.13 Start the pump.

2.14 Close the valve on the backfill port of the pumping station. Open the valve between the pump and the pumping port. Open the isolation valve on the probe.

2.16After the pressure falls below 1 torr close the valve between the pump and the pumping port. Open the backfill valve on the pumping port and allow the probe to backfill with helium until helium begins to escape from the check valve on the probe.

2.17 Repeat the pumpdown and helium backfill of the probe two more times. Close the probe isolation valve and disconnect the probe from the plastic tube.

2.18 Fill the bucket with liquid nitrogen.

2.19 Insert the end of the probe containing the transformer into the bucket. Secure the probe vertically at mid length with the bicycle stand. Allow a minimum of 10 minutes for the probe to cool then remove from the bucket.

2.20 Place the cold end of the probe in front of the heater and turn the heater on, again securing the probe vertically at mid length with the bicycle stand.

2.21 Allow the probe sufficient time for the temperature to rise above freezing as evidenced by melting of the frost on the end.

2.22 Repeat the above thermal cycling for a total of 3 times. Remove transforemer from probe.

3.0 Trim ends of transformer wires to remove solder. Clean transformer with alcohol. Submit for magnetic screening.

3.1 After screening, solder wire extensions as needed to allow electrical checks. Solder center tap together and insulate with the exposed solder with heat shrink tubing. Using Keithley 580 measure and record in Table P0155-2 the round-trip resistances and cross resistances as indicated.

3.2 Cut a 4"piece of platinum wire. Fold the wire in half. Use the hand drill to twist it into a twisted pair. Cut into 1/2″ segments.

3.3 Strip 1/8" of insulation off each end of resistance wire. Use the Keithley 580 Micro-Ohmmeter to determine the sum of the 2 end-to-end resistances. Use LCZ meter to measure inductances as indicated in Table P0155-2. Record all results in Table P0155-2.

3.4 Solder the Platinum wire to the transformer. Use the Keithley 580 Miro-Ohmmerter measure the resistance of the Primary leads and secondary leads. Use the BK 2706 handmeter to measure resistance from primary leads to secondary leads. Record results in Table P0155-2.

3.5 Verify measurements from Table P0155-2 conform to acceptable values as given in Table P0155-3.

4.0 Using microscope inspect transformer and verify no damage to part. If damage is found contact REE.

Table P0155-1. Output Transformer Inductance Measurements

P/N 25432-201 Rev - Output Transformer Serial No_____
LCZ meter serial number_____
Calibration Expiration Date_____

Measurement	**Part no.**	**Nominal Value**	**Measured Value**	**Operator**	**Date**
Output Transformer Primary Inductance	25432-201	5.4 µH ±10%			
Primary-Secondary Series Inductance A	25432-201				
Primary-Secondary Series Inductance B	25432-201				
Mutual Inductance	25432-201	55 µH +/-10%			
Output Transformer Secondary Inductance	25432-201	560 µH ±10%			
Output Transformer Secondary* Center Tap to Leg 1 Inductance	25432-201	140 µH ±10%			
Output Transformer Secondary* Center Tap to Leg 2 Inductance	25432-201	140 µH ±10%			

* Inductances must match to 2%. Transformer Serial Number:

Table P0155-2 Resistance and Inductance of Output Transformer w/ Center Tap

LCZ Serial Number_____
LCZ calibration expiration date_____
Ohm meter Serial Number
Ohm meter expiration date_____

Operator: _____ Transformer Serial Number: _____

Date: _____

Step	Resistance				
	Primary Coil	Secondary Coil			Primary to Secondary
		End 1 to Center	End 2 to Center	End 1 to End 2	
3.1					
3.4					
3.3	Resistance wire:				
	Inductance				
	Primary Coil	Secondary Coil			Comments
		End 1 to Center	End 2 to Center	End 1 to End 2	
3.3					

Table P0155-3 Resistance and Inductance Range of Output Transformer

Step	Resistance				
	Primary Coil	Secondary Coil			Primary to Secondary
		End 1 to Center	End 2 to Center	End 1 to End 2	
3.1	0.1-0.2 Ω	0.4-0.6 Ω	0.4-0.6 Ω	0.8-1.2 Ω	Open
3.4	1.6-2.2 Ω	0.4-0.6 Ω	0.4-0.6 Ω	0.8-1.2 Ω	Open
3.3	Resistance wire: 0.9-1.1 Ω				
	Inductance				
	Primary Coil	Secondary Coil			
		End 1 to Center	End 2 to Center	End 1 to End 2	
3.3	4.0-6.0 µH	120-140 µH	120-140 µH	400-600 µH	