IES UTILITIES INC.

Fort Madison/Keokuk District

Subtransmission/Transmission System Study

System Planning Department

May 1995

UPDATED SUMMER 2001

IES UTILITIES INC. - SYSTEM PLANNING

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TABLE OF CONTENTS

Attachments:

1. Keokuk 161 kv (B1), 69 kv (B2), and 69 kv (B3) Plan Estimated Costs.
2. AFUDC calculations for 161 kv (B1), 69 kv (B2), and 69 kv (B3) Plans.
3. Present Worth Analysis for 161 kv (B1), 69 kv (B2), and 69 kv (B3) Plans.
4. Selected Load Flow Cases.
5. Line Construction Maps.
6. Expected Megawatt Loads

EXECUTIVE SUMMARY

Fort Madison reliability is good. Reliability of the 69 kv system is of marginal adequacy in the Keokuk area. In the past, with an outage of the single Carbide 161/69 kv transformer, overloading of the Keokuk Hydro-Messenger line occurred. With the addition of the Keokuk Hydro-Roquette 69 kv line, loading on the Keokuk Hydro-Messenger line can be significantly reduced by splitting power flows. Optimum utilization of this new line will occur when it can be operated in a network following relay modifications later this year.

In later years loss of either the Burlington Generating Station or Palmyra 345/161 kv transformer causes low voltage in the entire IES southeast Iowa system. In addition should load growth continue in the Roquette area of Keokuk, either through Roquette expansion or conversion of Ferrosil load from 25 cycle to 60 cycle, the existing 69 kv system will be inadequate during contingency conditions.

Three plans to address the expected Keokuk area load growth were modeled and reviewed. The plans were a 161 kv plan which placed Roquette and Ferrosil on 161 kv, a 69 kv plan which added another Carbide transformer and an additional 69 kv line to Roquette and left all load on 69 kv, and a hybrid 69 kv plan which would be constructed to allow future conversion to 161 kv. All plans provided two 161 kv lines into Carbide. Best performance occurred with the 161 kv plan with an estimated capital cost of $13.9 million. This plan had a net present value which was 3.07% higher than the lowest cost plan. However, due to limitations and performance of the low cost plan, the small additional cost is justified. The 161 kv plan is recommended as the best overall plan. Components of the 161 kv plan are outlined below:

The best solution for the Fort Madison area:

1) By 12/31/95 - Connect second Viele transformer.
2) By 12/31/96 - Rebuild 10.8 miles of 34 kv line to 69 kv (continue to operate at 34 kv) from Donnellson to Farmington and rebuild of approximately 3.0 miles of 34 kv line to 69 kv (continue to operate at 34 kv) west of Farmington.
3) By 12/31/96 - Construct a 161 kv line from Burlington Generating Station (16 miles) to Niota, Illinois and install a 161/69 kv Niota substation. IES is responsible for line construction, CIPS will design and build the substation with IES responsible for 60% of the cost.
4) By 12/31/97 - Install (1) 69 kv circuit breaker at Viele and convert Viele- Donnellson-Farmington 34 kv to 69 kv. Northeast Missouri Electric Power Coop (NEMO) will install (3) 69 kv circuit breakers at Bonaparte, including interconnection metering. This line will be operated networked in conjunction with NEMO.
5) By 5/1/98 - Add 24.3 mvars 69 kV capacitors at BGS.
6) By 6/30/98 - Install a 161/138 kv substation at Niota, Illinois and construct a 138 kv line (42 miles) to Macomb, Illinois. CIPS is responsible for line construction. CIPS will design and build the substation with IES responsible for 50% of the substation cost.
7) By 5/1/2000 - Install a 161 kv, 50 mvar capacitor at Burlington Generating Station (BGS), a part of the Burlington District.

In March, 1994 IES and Central Illinois Public Service (CIPS) signed a Letter of Intent to proceed with items 3 and 6 in a joint manner. Development of this Letter followed extensive study of the southeast Iowa and west central Illinois transmission systems.

The best solution for the Keokuk area is:

1) By 12/01/95 - Install West Keokuk 69/12.5 kv-Substation .
2) By 12/31/95 - Raise Carbide breaker 9870 CT limit above 88 mva.
3) By 12/31/95 - Install (3) 161 kv manual operated switches at the Carbide Tap to permit sectionalizing of the Palmyra-Carbide Tap-Viele 161 kv line.
4) By 12/31/95 - Install (2) 69 kv vacuum switches to permit staged switching of Carbide capacitor bank.
5) By 12/31/96 - Install (1) 69 kv circuit breaker and construct approximately 0.5 miles of 69 kv line to create a Carbide-Messenger-Hydro 69 kv line and a Carbide-West Keokuk-Hydro 69 kv line.
6) By 1/1/97 - Construct 4.5 miles of 161 kv from Carbide to a new 161/12 kv distribution substation located near Roquette.
7) By 1/1/97 - Construct a new 161/12 kv distribution substation near Roquette and convert Roquette loads to 161/12 kv.
8) By 1/1/98 - Rebuild 1 mile of 69 kv line (Carbide-Messenger) to 1000 Amp capacity.
9) By 1/1/98 - Replace 600 Amp breaker at Keokuk Hydro with 750 Amp or greater rated breaker.
10) By 1/1/98 - Construct a 2nd 161 kv line from Viele to Carbide (12.5 miles).
11) By 1/1/98 - Re-configure the Carbide Tap-Carbide 161 kv line to become a Palmyra, Mo.-Roquette-Carbide-Viele 161 kv line.
12) By 1/1/98 - Retire existing Roquette and Commercial distribution substations.
13) By 1/1/98 - Raise Messenger breaker 9890 CT limit above 88 mva.
14) By 1/1/98 - Build Ferrosil Substation if Ferrosil cannot be served from Roquette Substation.
15) By 5/1/2002 - Install a 161 kv, 50 mvar capacitor at Carbide.

Alternatives reviewed included 345 kv from either OGS (80 miles) or the Louisa Generating Station (60 miles) of IIGE. However, due to cost these alternatives were not considered as viable.

DISCUSSION

The major load areas in the district are Fort Madison and Keokuk, with a total load of approximately 160 mw.

Service to Fort Madison is provided through the Viele 161/69 kv substation containing a single top-rated 84 mva transformer. 161 kv lines from Denmark and Palmyra, Missouri (Associated Electric) provide the high voltage service. 69 kv service is provided through lines from Sawyer and Carbide (Keokuk) terminating at Viele and (2) lines from Hamilton, Illinois through the Central Illinois Public Service (CIPS) system and terminating at Lee.

Service to Keokuk is provided through the Carbide 161/69 kv substation on a radial 161 kv line and the Keokuk Hydro Plant of Union Electric. 69 kv service is provided through a line from Viele, terminating at Carbide.

Study of the Fort Madison/Keokuk District was accomplished by using PSS/E Loadflow software, developed by Power Technologies, Inc. of Schenectady, NY. The electric system was modeled as exists today with any committed additions (budgeted) included.

Interruptible load was assumed to be served by IES Utilities Inc. at the time of peak. Load growth for this area is assumed to be approximately 1% per year, although growth rates vary from substation to substation. Large industrial customers were assumed to have a 0% annual load growth, with any load growth coming through discrete 'blocks' of growth via plant expansions, etc.

Over the past 28 months that IES has had this service territory numerous outages/service interruptions have occurred. The solutions contained in this report, along with other measures underway will provide a higher degree of reliability to the system than has been experienced in recent times.

The major problems in the district are centered in the Keokuk area. As noted above, Keokuk is served by the Carbide 161/69 kv substation. This substation is on a 15 mile radial 161 kv line, tapping the Viele to Palmyra 161 kv line. Total exposure is over 70 miles, with no sectionalizing switches at the Carbide Tap, a section of line owned and operated by Union Electric. Until recently, when service to Carbide was interrupted, back-up service to Keokuk was provided through (2) 69 kv lines, one from Viele and the other from the Keokuk Hydro Plant. Because of distance and hence impedances the major flow during this contingency was on the Messenger-Keokuk Hydro Plant line, rated at 72 mva. The 72 mva rating is a breaker rating at the Keokuk Hydro Plant with the actual line rating being 88 mva. The 72 mva limiting factor is a 600 amp circuit breaker at Keokuk Hydro. Flows in excess of 65 megawatts are not uncommon on the Hydro-Messenger line during Carbide transformer out contingencies, thus creating either an overload or near overload condition. With the addition of the Keokuk Hydro-Roquette 69 kv line, loading on the Keokuk Hydro-Messenger line can be significantly reduced by splitting power flows. Optimum utilization of this new line will occur when it can be operated in a network following relay modifications. Network operation of the new Hydro-Roquette 69 kv line, scheduled for late 1995 will solve the loading problem on the Hydro-Messenger line.

While network operation of the Roquette-Hydro 69 kv line will solve the overload of Messenger-Hydro during contingencies, the majority of Keokuk would be subject to an outage for a single fault almost anywhere on the 69 kv system within the city. This is due to the fact that a single 69 kv circuit breaker (9860) at Carbide protects all of the 69 kv system with the exception of the Hydro-Messenger 69 kv line. Thus a fault west of Messenger would interrupt service to all substations except (1) transformer at Messenger. Termination of the Roquette-Hydro line on the existing breaker 9870 (Wayland, Mo.) is recommended in the short term. This can be accomplished by operating switch 9861 N.O. and switch 9862 N.C.

The 69 kv capacitor at Carbide is a single stage 33 megavar unit, controlled either manually or by voltage control. At less than peak load conditions, voltage sags, thus forcing the voltage control to bring the capacitor on-line. Once the capacitor is on-line, the result is high voltage, either resulting in the voltage control being required to take the capacitor off-line or manual intervention.

The Farmington/Donnellson area of the district is also in need of attention. Presently backup between the two towns is provided through a 10.8 mile 34 kv line, with Donnellson and Farmington being 30 degrees out of phase with each other, resulting in a drop and pick-up condition. The line is rated the worst line within the IES system, in terms of physical condition. Presently because of the condition of both the line and the route, the line is operated in a normal open condition on both ends, or an out-of-service status. Ability to restore service to either Donnellson or Farmington during contingencies could be jeopardized as a fault could be present on the out-of-service line and not detected until a contingency forced the line to be energized.

In 1992 IES and Central Illinois Public Service (CIPS) discussed possible joint planning alternatives and development of plans that would improve the reliability for both parties as well as provide an additional interconnection with another power pool. The result of such discussions resulted in a plan for a high voltage transmission line between Burlington Generating Station and Macomb, Illinois via Fort Madison. The parties signed a Letter of Intent in March of 1994 and are presently developing schedules, designs, etc. to accomplish such.

Three basic plans were developed to address the expected major load growth in the Keokuk area and are designated B1, B2, and B3. Each has many common facilities (161/138 kv tie to CIPS, Viele-Farmington 69 kv line, West Keokuk Substation, etc.). The principal differences are related to long range Keokuk plans. The three plans consist of:

B1 - New Roquette/Ferrosil 161/12.5 kv substation with two 161 kv transmission lines.

B2 - New Roquette/Ferrosil 69/12.5 kv substation with three 69 kv transmission lines into the substation. In plan B2, the 4.5 mile 69 kv line from Carbide to Roquette is operated at 69 kv but constructed to 161 kv requirements to allow future upgrade. The Roquette/Ferrosil Substation is laid out such that future installation of 161 kv equipment is possible.

B3 - The B3 plan is functionally identical to the B2 plan except all substation and line construction is for 69 kv only.

At this time it is not known whether Roquette will allow Ferrosil to be served from the same substation as they are. To account for this in the economic comparison of the three plans, an additional cost estimate for each plan was prepared with the cost of a separate Ferrosil Substation included. *Attachment 1 lists costs associated with each plan. Attachment 2 lists the AFUDC calculations and* annual expense breakdown associated with the plans. Below is a table of present worth associated with each plan. Values were taken from Attachment 3.

	B1 (161 kv)	B2 (69 kv)	B3 (69 kv)
Combined Ferrosil/Roquette Sub	$11,323,904	$11,844,886	$11,043,648
Separate Ferrosil and Roquette Subs	$11,814,044	$12,232,567	$11,462,207

Due to the expansion of 60 Hz load in the Keokuk area, changes in the existing system are required. The expected increase in load, primarily from Roquette expansion, Ferrosil 25 to 60 Hz conversion, and Midwest Carbide 25 to 60 Hz conversion, is approximately 55 megawatts by 1998 and 65 megawatts by 2006. Additionally, re-distribution of existing Terminal substation loads along with normal load growth in the Keokuk area may add another 10 megawatts by 1998 and 17 megawatts by 2006 to the 69 kv system. This information was utilized to study the Keokuk area in 1998 and 2006.

Along with the above load information, the BGS/Niota/Macomb project was included in the modeling process to better reflect expected system configuration. The second Viele transformer was also included in the modeling process. The following describes the two long range plans studied to address the expected load growth.

The three plans B1(161 kv), B2(69 kv), and B3(69 kv) were added to the 1998 and 2006 models to determine their ability to support the Keokuk load growth under various contingencies. NOTE: For load flow modeling purposes, plan B2 and B3 are identical therefore, only plan B2 load flows are included in this report. The B1 (161 kv) plan builds approximately 17 miles of 161 kv line and puts both the Roquette and Ferrosil loads on 161 kv. Construction of the 161 kv is such that a 161 kv network is formed from Palmyra to Roquette/Ferrosil to Carbide to Viele. The B2 (69 kv) plan builds approximately 10.25 miles of 161 kv line forming a Palmyra to Carbide to Viele network. In addition, a second Carbide 161/69 kv transformer is installed and a second 69 kv, Carbide to new Roquette substation, line is built. This line is approximately 4.5 miles long and is constructed to 161 kv standards. All new load remains on the 69 kv system. Since the existing Roquette substation must be moved, approximately 3.2 (1.6 miles of double circuit) additional miles of 69 kv line will have to be built. Plan B3(69 kv) is functionally identical to B2

except the 4.5 mile 69 kv line is built to 69 kv standards and the 69 kv Roquette substation is laid out only for 69 kv equipment.

Review of the various contingencies which were run on the two plans in both 1998 and 2006 identified that the 69 kv plan begins to have minor overloads in 1998. The new Hydro to Roquette line is overloaded by approximately 4% and 7%, respectively in two of seven contingencies, the Hydro to Messenger line is overloaded approximately 9% during one contingency, and the Hamilton 96 mva 138/69 kv transformer loads to 100% during one contingency. In addition, the Messenger-Carbide line loads to 127% during one contingency.

No line overloads occurred with the 161 kv plan in 1998 except the Messenger-Carbide line which loads to 114% during one contingency.

In 2006, the 69 kv plan loads the Hydro to Roquette line to 103% with no contingencies and overloads of up to approximately 125% occur under two different contingencies. During two different contingencies, the Hamilton 96 mva 138/69 transformer overloads at approximately 117% and during another contingency overloads at 108%. During one contingency, the Carbide to Commercial Tap overloads at 103% and the Hamilton to Keokuk Hydro overloads at 110%. The Messenger-Carbide line loads to 145% and the Keokuk Hydro to Messenger line loads to 124% during one contingency.

In 2006, the 161 kv plan begins to have minor overloads during certain contingencies. During one contingency, the Messenger to Hydro line overloads at approximately 111%, and during two contingencies, the Hamilton 96 mva 138/69 transformer overloads at 105% and 100% respectively. The Messenger-Carbide line loads to 126% during one contingency.

It should be noted that a 600 amp breaker associated with the Hydro to Messenger line must be replaced with a 750 amp or larger breaker to allow maximum utilization of the line. The load flows were reviewed as if change out of this breaker has already been done. Rebuilding of the 1 mile 4/0 copper/266 ACSR Carbide-Messenger 69 kv line is recommended in both plans.

Due to the low voltages seen in the Keokuk-Fort Madison area during two of the seven contingencies run, capacitor additions were made to the four base (1998B 69 kv, 1998B 161 kv, 2006B 69 kv, 2006B 161 kv) models. In addition, the Carbide to Messenger line was replaced with a new 1000 amp line. The same seven contingencies were run with the following outcome:

Review of the various contingencies which were run on the two plans in both 1998 and 2006 after addition of the new Carbide-Messenger line as well as scheduled capacitors, identified that the 69 kv plan still has minor overloads in 1998. The new Hydro to Roquette line is overloaded by approximately 3% and 6%, respectively in two of seven contingencies, the Hydro to Messenger line is overloaded approximately 9% during one contingency, and the Hamilton 96 mva 138/69 kv transformer loads to 100% during one contingency.

No line overloads occurred with the 161 kv plan in 1998.

In 2006, the 69 kv plan loads the Hydro to Roquette line to 98% with no contingencies and overloads of 102%, 104%, 112% and 118% occur during four contingencies. During two different contingencies, the Hamilton 96 mva 138/69 transformer overloads at approximately 113% and during another contingency overloads at 119%. During one contingency, the Carbide-Commercial Tap line loads to 98%, the Hamilton to Keokuk Hydro line overloads at 119%, and the Hamilton-Keokuk Hydro line overloads at 108%.

In 2006, the 161 kv plan begins to have minor overloads during certain contingencies. During one contingency, the Messenger to Hydro line overloads at approximately 110%, and during two contingencies, the Hamilton 96 mva 138/69 transformer loads at 107% and 100% respectively.

Voltage Problems in the Keokuk and Fort Madison area are corrected by the capacitor additions in all years reviewed.

In addition to study of the 1998 and 2006 time frames, 1996 was reviewed. One overload was identified during an outage of the new Keokuk Hydro-Roquette line. The limitation is a current transformer setting of 72 mva. This setting can be raised above the next limitation which is at 88 mva (556 ACSR Line). The overload on the 88 mva line would be approximately 2% in summer 1996 during the contingency. Overloads were not seen on this line once Ferrosil and Roquette are moved to 161 kv.

SOLUTIONS

The best plan for the Keokuk-Fort Madison area is Plan B1 the 161 kv plan, which consists of:

Fort Madison

1) By 12/31/95 - Connect second Viele transformer.
2) By 12/31/96 - Rebuild 10.8 miles of 34 kv line to 69 kv (continue to operate at 34 kv) from Donnellson to Farmington and rebuild of approximately 3.0 miles of 34 kv line to 69 kv (continue to operate at 34 kv) west of Farmington.
3) By 12/31/96 - Construct a 161 kv line from Burlington Generating Station (16 miles) to Niota, Illinois and install a 161/69 kv Niota substation. IES is responsible for line construction, CIPS will design and build the substation with IES responsible for 60% of the cost.
4) By 12/31/97 - Install (1) 69 kv circuit breaker at Viele and convert Viele- Donnellson-Farmington 34 kv to 69 kv. Northeast Missouri Electric Power Coop (NEMO) will install (3) 69 kv circuit breakers at Bonaparte, including interconnection metering. This line will be operated networked in conjunction with NEMO.
5) By 5/1/98 - Add 24.3 mvars 69 kV capacitors at BGS.
6) By 6/30/98 - Install a 161/138 kv substation at Niota, Illinois and construct a 138 kv line (42 miles) to Macomb, Illinois. CIPS is responsible for line construction. CIPS will design and build the substation with IES responsible for 50% of the substation cost.
7) By 5/1/2000 - Install a 161 kv, 50 mvar capacitor at Burlington Generating Station (BGS), a part of the Burlington District.

In March, 1994 IES and Central Illinois Public Service (CIPS) signed a Letter of Intent to proceed with items 3 and 6 in a joint manner. Development of this Letter followed extensive study of the southeast Iowa and west central Illinois transmission systems.

Keokuk

1) By 12/01/95 -Install West Keokuk 69/12.5 kv-Substation .
2) By 12/31/95 - Raise carbide breaker 9870 CT limit above 88 mva.
3) By 12/31/95 - Install (3) 161 kv manual operated switches at the Carbide Tap to permit sectionalizing of the Palmyra-Carbide Tap-Viele 161 kv line.
4) By 12/31/95 - Install (2) 69 kv vacuum switches to permit staged switching of Carbide capacitor bank.
5) By 12/31/96 - Install (1) 69 kv circuit breaker and construct approximately 0.5 miles of 69 kv line to create a Carbide-Messenger-Hydro 69 kv line and a Carbide-West Keokuk-Hydro 69 kv line.
6) By 1/1/97 - Construct 4.5 miles of 161 kv from Carbide to a new 161/12 kv distribution substation located near Roquette.
7) By 1/1/97 - Construct a new 161/12 kv distribution substation near Roquette and convert Roquette loads to 161/12 kv.

8) By 1/1/98 - Rebuild 1 mile of 69 kv line (Carbide-Messenger) to 1000 Amp capacity.
9) By 1/1/98 - Replace 600 Amp breaker at Keokuk Hydro with 750 Amp or greater rated breaker.
10) By 1/1/98 - Construct a 2nd 161 kv line from Viele to Carbide (12.5 miles).
11) By 1/1/98 - Re-configure the Carbide Tap-Carbide 161 kv line to become a Palmyra, Mo.-Roquette-Carbide-Viele 161 kv line.
12) By 1/1/98 - Retire existing Roquette and Commercial distribution substations.
13) By 1/1/98 - Raise Messenger breaker 9890 CT limit above 88 mva.
14) By 1/1/98 - Build Ferrosil Substation if Ferrosil cannot be served from Roquette Substation.
15) By 5/1/2002 - Install a 161 kv, 50 mvar capacitor at Carbide.

The other plans considered were the B2 and B3 69 kv plans in the Keokuk area. Only the facilities in Keokuk are detailed since the Fort Madison facilities are common to Plans B1, B2, and B3.

Plan B2:

1) By 12/01/95 -Install West Keokuk 69/12.5 kv-Substation.
2) By 12/31/95 - Raise Carbide breaker 9870 CT limit above 88 mva.
3) By 12/31/95 - Install (3) 161 kv manual operated switches at the Carbide Tap to permit sectionalizing of the Palmyra-Carbide Tap-Viele 161 kv line.
4) By 12/31/95 - Install (2) 69 kv vacuum switches to permit staged switching of Carbide capacitor bank.
5) By 12/31/96 - Install (1) 69 kv circuit breaker and construct approximately 0.5 miles of 69 kv line to create a Carbide-Messenger-Hydro 69 kv line and a Carbide-West Keokuk-Hydro 69 kv line.
6) By 1/1/97 - Construct 4.5 miles of 161 kv (operated at 69 kv) from Carbide to a new 69/12 kv distribution substation located near Roquette.
7) By 1/1/97 - Construct 1.6 miles of double circuit 69 kv to tie in new Roquette substation.
8) By 1/1/97 - Construct a new 69/12 kv distribution substation downstream from Roquette and transfer Roquette loads away from the existing substation.
9) By 1/1/97 - Rebuild 1 mile of 69 kv line (Carbide-Messenger) to 1000 Amp Capacity.
10) By 1/1/97 - Replace 600 AMP breaker at Keokuk Hydro with 750 AMP or greater rated breaker.
11) By 1/1/97 - Raise Messenger breaker 9890 CT limit above 88 mva.
12) By 1/1/98 - Construct a 2nd 161 kv line from Viele to Carbide (10.25 miles).
13) By 1/1/98 - Re-configure the Carbide Tap-Carbide 161 kv line to become a Palmyra, Mo.-Carbide-Viele 161 kv line.
14) By 1/1/98 - Retire existing Roquette and Commercial distribution substations.
15) By 1/1/98 - Build Ferrosil Substation if Ferrosil cannot be served from Roquette Substation.
16) By 5/1/2002 - Install a 161 kv, 50 mvar capacitor at Carbide

Plan B3: All line items in B3 are the same as in B2 except Item 6.

5) By 1/1/97 - Construct 4.5 miles of 69 kv line from carbide to new 69/12 kv distribution substation located near Roquette.

CONCLUSIONS

Power Supply to Burlington - Fort Madison - Keokuk area comes from these sources:

Denmark - Viele - Palmyra, MO 161 kv line
UE East Quincy, IL - Hamilton, IL 138 kv line
UE Keokuk Hydro plant 60 MW
Burlington Generating Station 211 MW

After review of load flows and economic studies associated with the various plans, plan B1 appears to be the best choice regardless of whether a separate Ferrosil substation must be constructed. With respect to cost, plan B3 is the cheapest, however, the 69 kv system begins to overload with this plan in the not too distant future. In addition, plan B3 is not flexible in that future upgrade to a 161 kv system would require significantly more cost than building the B1 plan initially. For these reasons, the additional present worth cost of the B1 plan verses B3 ($280,256 (2.54%) - $351,837 (3.07%) depending on Ferrosil source) is considered justified. Plan B2 allows flexibility for future 161 kv upgrade, however, its present worth cost is higher than both other plans not including any upgrade costs. Loading of the 69 kv system in B2 is the same as B3.

The recommended plan B1 has the following major features:

1) Splits the Viele - Palmyra, MO 161 kv line to provide two independent 161 kv feeds into Carbide Substation (Keokuk).
2) Picks up major Keokuk load growth at 161 kv. Note: Items 1) and 2) involve 17 miles of new 161 kv line construction.
3) Establishes a new 138 kv/ 161 kv interconnection with CIPS near Fort Madison
4) Makes efficient use of the present 69 kv network both in the short and long term.
5) Involves 100+ mva of new transmission voltage class capacitors to maintain area voltage for various contingencies.

The recommended plan B1 serves expected load growth with a minimal investment.

Review of Keokuk Area Loads – 2001 Summer

A review of the 2001 summer Keokuk, IA peak loads was conducted to determine if the need for the Viele-Twin Rivers 161 kv line was still valid. The original study basis in 1995 was 102 mw of load in the City of Keokuk. A review of 1997 loads confirmed a load of 116 mw in the same area. A review of 2001 summer peak found 111 megawatts of load in the City of Keokuk.

Other factors to consider: presently the remaining 25 cycle customers are converting machinery, etc. within their plant to 60 cycle operation. Ameren-UE exercised their contractual right to terminate 25 cycle service with an effective date of September 25, 2001. The 111 megawatt peak Keokuk load did not contain the above noted 25 cycle load. Had this load been converted to 60 cycle service, an additional 7.5 mw would have been on the 60 cycle system or an adjusted load of 118.5 megawatts.

Conclusion: while load growth has not been as high as originally estimated, the factors present that required the line in 1995 still exist.

ATTACHMENT 1
KEOKUK 161KV (B1) AND 69KV (B2) PLAN
ESTIMATED COSTS

161KV (B1) PLAN WITH FERROSIL AT ROQUETTE SUB

Item	# of Units	$1000's/Unit	Cost in $1000's
Carbide-Roquette 161kv Construction	4.5	300	1350
Viele-Carbide 161kv Construction	4	300	1200
Palmyra-Roquette Double Circuit 161/69kv	3.75	400	1500
Palmyra-Roquette Single 161kv Construction	4.75	300	1425
Carbide MO Switches	2	125	250
Carbide Circuit Switcher	1	300	300
Keokuk Hydro 750 amp breaker	1	50	50
Upgrade 1 mile 69kv Carbide-Messenger	1	200	200
161kv Capacitors	2	700	1400
69kv Capacitors	1	270	270
Roquette Sub w/Ferrosil - Straight Bus	1	5240	5240
TOTAL			13185
Ring Bus at Roquette (ADD)			635
TOTAL			13820

69KV (B2) PLAN WITH FERROSIL AT ROQUETTE SUB

Item	# of Units	$1000's/Unit	Cost in $1000's
Carbide-Roquette 161kv Const/ 69kv Oper.	4.5	300	1350
Viele-Carbide 161kv Construction	4	300	1200
Palmyra-Carbide Double Circuit 161/69kv	6.25	400	2500
69kv Taps to Roquette (Double Circuit)	1.6	225	360
Carbide 161/69 XFMR Addition	1	2000	2000
Roquette Sub w/Ferrosil - Straight Bus	1	4333	4333
Keokuk Hydro 750 amp breaker	1	50	50
Upgrade 1 mile 69kv Carbide-Messenger	1	200	200
161kv Capacitors	2	700	1400
69kv Capacitors	1	270	270
TOTAL			13663
Ring Bus at Roquette (ADD)			531
TOTAL			14194

161KV (B1) PLAN WITHOUT FERROSIL AT ROQUETTE SUB/ SEPARATE FERROSIL SUB

Item	# of Units	$1000's/Unit	Cost in $1000's
Carbide-Roquette 161kv Construction	4.5	300	1350
Viele-Carbide 161kv Construction	4	300	1200
Palmyra-Roquette Double Circuit 161/69kv	3.75	400	1500
Palmyra-Roquette Single 161kv Construction	4.75	300	1425
Carbide MO Switches	2	125	250
Carbide Circuit Switcher	1	300	300
Keokuk Hydro 750 amp breaker	1	50	50
Upgrade 1 mile 69kv Carbide-Messenger	1	200	200
161kv Capacitors	2	700	1400
Roquette Sub w/o Ferrosil - Straight Bus	1	4239	4239
69kv Capacitors	1	270	270
Ferrosil 161kv Sub			1710
TOTAL			13894
Ring Bus at Roquette (ADD)			614
TOTAL			14508

69KV (B2) PLAN WITHOUT FERROSIL AT ROQUETTE SUB/SEPARATE FERROSIL SUB

Item	# of Units	$1000's/Unit	Cost in $1000's
Carbide-Roquette 161kv Const/ 69kv Oper.	4.5	300	1350
Viele-Carbide 161kv Construction	4	300	1200
Palmyra-Carbide Double Circuit 161/69kv	6.25	400	2500
69kv Taps to Roquette (Double Circuit)	1.6	225	360
Carbide 161/69 XFMR Addition	1	2000	2000
Roquette Sub w/o Ferrosil - Straight Bus	1	3535	3535
Keokuk Hydro 750 amp breaker	1	50	50
Upgrade 1 mile 69kv Carbide-Messenger	1	200	200
Ferrosil 69kv sub	1	1370	1370
161kv Capacitors	2	700	1400
69kv Capacitors	1	270	270
TOTAL			14235
Ring Bus at Roquette (ADD)			505
TOTAL			14740

Note: The cost of land for substations is not included in any "TOTALS". Installation of a ring bus adds approximately 17500 square feet to the size of the Roquette substation.

ESTIMATED COSTS PROVIDED BY SUBSTATION AND TRANSMISSION ENGINEERING

ROQUETTE.XLS

ATTACHMENT 1

ATTACHMENT 1
KEOKUK 161KV (B1) AND 69KV (B2 AND B3) PLAN
ESTIMATED COSTS

69KV (B3) PLAN WITH FERROSIL AT ROQUETTE SUB

Item	# of Units	$1000's/Unit	Cost in $1000's
Carbide-Roquette 69kv Construction	4.5	150	675
Viele-Carbide 161kv Construction	4	300	1200
Palmyra-Carbide Double Circuit 161/69kv	6.25	400	2500
69kv Taps to Roquette (Double Circuit)	1.6	225	360
Carbide 161/69 XFMR Addition	1	2000	2000
Roquette Sub w/Ferrosil - Straight Bus	1	4155	4155
Keokuk Hydro 750 amp breaker	1	50	50
Upgrade 1 mile 69kv Carbide-Messenger	1	200	200
161kv Capacitors	2	700	1400
69kv Capacitors	1	270	270
TOTAL			12810
Ring Bus at Roquette (ADD)			531
TOTAL			13341

69KV (B3) PLAN WITHOUT FERROSIL AT ROQUETTE SUB/SEPARATE FERROSIL SUB

Item	# of Units	$1000's/Unit	Cost in $1000's
Carbide-Roquette 69kv Construction	4.5	150	675
Viele-Carbide 161kv Construction	4	300	1200
Palmyra-Carbide Double Circuit 161/69kv	6.25	400	2500
69kv Taps to Roquette (Double Circuit)	1.6	225	360
Carbide 161/69 XFMR Addition	1	2000	2000
Roquette Sub w/o Ferrosil - Straight Bus	1	3390	3390
Keokuk Hydro 750 amp breaker	1	50	50
Upgrade 1 mile 69kv Carbide-Messenger	1	200	200
Ferrosil 69kv sub	1	1370	1370
161kv Capacitors	2	700	1400
69kv Capacitors	1	270	270
TOTAL			13415
Ring Bus at Roquette (ADD)			505
TOTAL			13920

Note: The cost of land for substations is not included in any "TOTALS". Installation of a ring bus adds approximately 17500 square feet to the size of the Roquette substation.

ESTIMATED COSTS PROVIDED BY SUBSTATION AND TRANSMISSION ENGINEERING

ROQUETTE.XLS

ATTACHMENT 1

ATTACHMENT 2
AFUDC CALCULATIONS USING 6% INTEREST

PLAN B1 COMBINED ROQUETTE/FERROSIL SUB

ROQUETTE SUB/CARBIDE MODS

	Expense	Months	Rate	Weighting	Total
1995	$ 400,000.00	6	6.00%	0.5	$ 6,000.00
1996	$ 5,390,000.00	12	6.00%	0.5	$ 185,700.00
					$ 191,700.00

VIELE-CARBIDE 161 4 MILES

	Expense	Months	Rate	Weighting	Total
1995	$ 75,000.00	6	6.00%	0.5	$ 1,125.00
1996	$ 625,000.00	12	6.00%	0.5	$ 23,250.00
1997	$ 500,000.00	12	6.00%	0.5	$ 57,000.00
					$ 81,375.00

PALMYRA-ROQUETTE 161 8.5 MILES

	Expense	Months	Rate	Weighting	Total
1995	$ 75,000.00	6	6.00%	0.5	$ 1,125.00
1996	$ 1,680,000.00	12	6.00%	0.5	$ 54,900.00
1997	$ 1,170,000.00	12	6.00%	0.5	$ 140,400.00
					$ 196,425.00

CARBIDE-ROQUETTE 161 4.5 MILES

	Expense	Months	Rate	Weighting	Total
1995	$ 175,000.00	6	6.00%	0.5	$ 2,625.00
1996	$ 1,175,000.00	12	6.00%	0.5	$ 45,750.00
					$ 48,375.00

KEOKUK BREAKER/CARBIDE-MESSENGER 1 MILE 69 LINE

	Expense	Months	Rate	Weighting	Total
1996	$ 25,000.00	12	6.00%	0.5	$ 750.00
1997	$ 225,000.00	12	6.00%	0.5	$ 8,250.00
					$ 9,000.00

1998 CAPACITOR

	Expense	Months	Rate	Weighting	Total
1997	$ 40,000.00	8	6.00%	0.5	$ 800.00
1998	$ 230,000.00	4	6.00%	0.5	$ 4,700.00
					$ 5,500.00

2000 CAPACITOR

	Expense	Months	Rate	Weighting	Total
1998	$ 100,000.00	8	6.00%	0.5	$ 2,000.00
2000	$ 600,000.00	4	6.00%	0.5	$ 12,000.00
					$ 14,000.00

2002 CAPACITOR

	Expense	Months	Rate	Weighting	Total
2001	$ 100,000.00	8	6.00%	0.5	$ 2,000.00
2002	$ 600,000.00	4	6.00%	0.5	$ 12,000.00
					$ 14,000.00

	AFUDC	CAPITAL	TOTAL
1996	$ 240,075.00	$ 7,140,000.00	$ 7,380,075.00
1997	$ 286,800.00	$ 4,375,000.00	$ 4,661,800.00
1998	$ 5,500.00	$ 270,000.00	$ 275,500.00
2000	$ 14,000.00	$ 700,000.00	$ 714,000.00
2002	$ 14,000.00	$ 700,000.00	$ 714,000.00
		$ 13,185,000.00	

PLAN B1 SEPARATE FERROSIL SUB

	Expense	Months	Rate	Weighting	Total
1995	$ 400,000.00	6	6.00%	0.5	$ 6,000.00
1996	$ 4,390,000.00	12	6.00%	0.5	$ 155,700.00
					$ 161,700.00

FERROSIL SUB

	Expense	Months	Rate	Weighting	Total
1995	$ 90,000.00	6	6.00%	0.5	$ 1,350.00
1996	$ 180,000.00	12	6.00%	0.5	$ 10,800.00
1997	$ 1,440,000.00	12	6.00%	0.5	$ 59,400.00
					$ 71,550.00

VIELE-CARBIDE 161 4 MILES

	Expense	Months	Rate	Weighting	Total
1995	$ 75,000.00	6	6.00%	0.5	$ 1,125.00
1996	$ 625,000.00	12	6.00%	0.5	$ 23,250.00
1997	$ 500,000.00	12	6.00%	0.5	$ 57,000.00
					$ 81,375.00

PALMYRA-ROQUETTE 161 8.5 MILES

	Expense	Months	Rate	Weighting	Total
1995	$ 75,000.00	6	6.00%	0.5	$ 1,125.00
1996	$ 1,680,000.00	12	6.00%	0.5	$ 54,900.00
1997	$ 1,170,000.00	12	6.00%	0.5	$ 140,400.00
					$ 196,425.00

CARBIDE-ROQUETTE 161 4.5 MILES

	Expense	Months	Rate	Weighting	Total
1995	$ 175,000.00	6	6.00%	0.5	$ 2,625.00
1996	$ 1,175,000.00	12	6.00%	0.5	$ 45,750.00
					$ 48,375.00

KEOKUK BREAKER/CARBIDE-MESSENGER 1 MILE 69 LINE

	Expense	Months	Rate	Weighting	Total
1996	$ 25,000.00	12	6.00%	0.5	$ 750.00
1997	$ 225,000.00	12	6.00%	0.5	$ 8,250.00
					$ 9,000.00

1998 CAPACITOR

	Expense	Months	Rate	Weighting	Total
1997	$ 40,000.00	8	6.00%	0.5	$ 800.00
1998	$ 230,000.00	4	6.00%	0.5	$ 4,700.00
					$ 5,500.00

2000 CAPACITOR

	Expense	Months	Rate	Weighting	Total
1998	$ 100,000.00	8	6.00%	0.5	$ 2,000.00
2000	$ 600,000.00	4	6.00%	0.5	$ 12,000.00
					$ 14,000.00

	AFUDC	CAPITAL	TOTAL
1996	$ 210,075.00	$ 6,140,000.00	$ 6,350,075.00
1997	$ 358,350.00	$ 6,085,000.00	$ 6,443,350.00
1998	$ 5,500.00	$ 270,000.00	$ 275,500.00
2000	$ 14,000.00	$ 700,000.00	$ 714,000.00
2002	$ 14,000.00	$ 700,000.00	$ 714,000.00
		$ 13,985,000.00	

ANNUAL COST BREAKDOWN PROVIDED BY SUBSTATION AND TRANSMISSION ENGINEERING

ATTACHMENT 2
AFUDC CALCULATIONS USING 6% INTEREST

	2002 CAPACITOR										
	Expense		Months	Rate	Weighting	Total					
2001	$	100,000.00	8	6.00%	0.5	$	2,000.00				
2002	$	600,000.00	4	6.00%	0.5	$	12,000.00				
						$	14,000.00				

ATTACHMENT 2
AFUDC CALCULATIONS USING 6% INTEREST

PLAN B2 COMBINED ROQUETTE/FERROSIL SUB

ROQUETTE SUB/CARBIDE MODS

	Expense	Months	Rate	Weighting	Total
1995	$ 508,000.00	8	6.00%	0.5	$ 7,620.00
1996	$ 5,825,000.00	12	6.00%	0.5	$ 205,230.00
					$ 212,850.00

161 LINES

	Expense	Months	Rate	Weighting	Total
1995	$ 250,000.00	8	6.00%	0.5	$ 3,750.00
1996	$ 1,950,000.00	12	6.00%	0.5	$ 73,500.00
1997	$ 1,500,000.00	12	6.00%	0.5	$ 177,000.00
					$ 254,250.00

69 lines

	Expense	Months	Rate	Weighting	Total
1995	$ 247,000.00	8	6.00%	0.5	$ 3,705.00
1996	$ 1,463,000.00	12	6.00%	0.5	$ 58,710.00
					$ 62,415.00

KEOKUK BREAKER/CARBIDE-MESSENGER 1 MILE 69 LINE

	Expense	Months	Rate	Weighting	Total
1995	$ 25,000.00	8	6.00%	0.5	$ 375.00
1996	$ 225,000.00	12	6.00%	0.5	$ 8,250.00
					$ 8,625.00

1996 CAPACITOR

	Expense	Months	Rate	Weighting	Total
1997	$ 40,000.00	8	6.00%	0.5	$ 800.00
1998	$ 230,000.00	4	6.00%	0.5	$ 4,700.00
					$ 5,500.00

2000 CAPACITOR

	Expense	Months	Rate	Weighting	Total
1999	$ 100,000.00	8	6.00%	0.5	$ 2,000.00
2000	$ 600,000.00	4	6.00%	0.5	$ 12,000.00
					$ 14,000.00

2002 CAPACITOR

	Expense	Months	Rate	Weighting	Total
2001	$ 100,000.00	8	6.00%	0.5	$ 2,000.00
2002	$ 600,000.00	4	6.00%	0.5	$ 12,000.00
					$ 14,000.00

	AFUDC	CAPITAL	TOTAL
1996	$ 283,890.00	$ 8,293,000.00	$ 8,576,890.00
1997	$ 254,250.00	$ 3,700,000.00	$ 3,954,250.00
1998	$ 5,500.00	$ 270,000.00	$ 275,500.00
2000	$ 14,000.00	$ 700,000.00	$ 714,000.00
2002	$ 14,000.00	$ 700,000.00	$ 714,000.00
		$ 13,663,000.00	

PLAN B2 SEPARATE ROQUETTE SUB

ROQUETTE SUB/CARBIDE MODS

	Expense	Months	Rate	Weighting	Total
1995	$ 475,000.00	8	6.00%	0.5	$ 7,125.00
1996	$ 5,060,000.00	12	6.00%	0.5	$ 180,300.00
					$ 187,425.00

FERROSIL SUB

	Expense	Months	Rate	Weighting	Total
1995	$ 30,000.00	8	6.00%	0.5	$ 450.00
1996	$ 80,000.00	12	6.00%	0.5	$ 4,200.00
1997	$ 1,200,000.00	12	6.00%	0.5	$ 44,400.00
					$ 49,050.00

161 LINES

	Expense	Months	Rate	Weighting	Total
1995	$ 250,000.00	8	6.00%	0.5	$ 3,750.00
1996	$ 1,950,000.00	12	6.00%	0.5	$ 73,500.00
1997	$ 1,500,000.00	12	6.00%	0.5	$ 177,000.00
					$ 254,250.00

69 lines

	Expense	Months	Rate	Weighting	Total
1995	$ 247,000.00	8	6.00%	0.5	$ 3,705.00
1996	$ 1,463,000.00	12	6.00%	0.5	$ 58,710.00
					$ 62,415.00

KEOKUK BREAKER/CARBIDE-MESSENGER 1 MILE 69 LINE

	Expense	Months	Rate	Weighting	Total
1995	$ 25,000.00	8	6.00%	0.5	$ 375.00
1996	$ 225,000.00	12	6.00%	0.5	$ 8,250.00
					$ 8,625.00

1996 CAPACITOR

	Expense	Months	Rate	Weighting	Total
1997	$ 40,000.00	8	6.00%	0.5	$ 800.00
1998	$ 230,000.00	4	6.00%	0.5	$ 4,700.00
					$ 5,500.00

2000 CAPACITOR

	Expense	Months	Rate	Weighting	Total
1999	$ 100,000.00	8	6.00%	0.5	$ 2,000.00
2000	$ 600,000.00	4	6.00%	0.5	$ 12,000.00
					$ 14,000.00

2002 CAPACITOR

	Expense	Months	Rate	Weighting	Total
2001	$ 100,000.00	8	6.00%	0.5	$ 2,000.00
2002	$ 600,000.00	4	6.00%	0.5	$ 12,000.00
					$ 14,000.00

	AFUDC	CAPITAL	TOTAL
1996	$ 258,485.00	$ 7,495,000.00	$ 7,753,485.00
1997	$ 303,300.00	$ 5,070,000.00	$ 5,373,300.00
1998	$ 5,500.00	$ 270,000.00	$ 275,500.00
2000	$ 14,000.00	$ 700,000.00	$ 714,000.00
2002	$ 14,000.00	$ 700,000.00	$ 714,000.00
		$ 14,235,000.00	

AFUDCCAL.XLS

ANNUAL COST BREAKDOWN PROVIDED BY SUBSTATION AND TRANSMISSION ENGINEERING

ATTACHMENT 2
AFUDC CALCULATIONS USING 6% INTEREST

PLAN B3 COMBINED ROQUETTE/FERROSIL SUB

ROQUETTE SUB/CARBIDE MODS

	Expense	Months	Rate	Weighting	Total
1995	$ 508,000.00	6	6.00%	0.5	$ 7,620.00
1996	$ 5,647,000.00	12	6.00%	0.5	$ 199,890.00
					$ 207,510.00

161 LINES

	Expense	Months	Rate	Weighting	Total
1995	$ 250,000.00	6	6.00%	0.5	$ 3,750.00
1996	$ 1,950,000.00	12	6.00%	0.5	$ 73,500.00
1997	$ 1,500,000.00	12	6.00%	0.5	$ 177,000.00
					$ 254,250.00

69 lines

	Expense	Months	Rate	Weighting	Total
1995	$ 172,000.00	6	6.00%	0.5	$ 2,580.00
1996	$ 863,000.00	12	6.00%	0.5	$ 36,210.00
					$ 38,790.00

KEOKUK BREAKER/CARBIDE-MESSENGER 1 MILE 69 LINE

	Expense	Months	Rate	Weighting	Total
1995	$ 25,000.00	6	6.00%	0.5	$ 375.00
1996	$ 225,000.00	12	6.00%	0.5	$ 8,250.00
					$ 8,625.00

1998 CAPACITOR

	Expense	Months	Rate	Weighting	Total
1997	$ 40,000.00	8	6.00%	0.5	$ 800.00
1998	$ 230,000.00	4	6.00%	0.5	$ 4,700.00
					$ 5,500.00

2000 CAPACITOR

	Expense	Months	Rate	Weighting	Total
1999	$ 100,000.00	8	6.00%	0.5	$ 2,000.00
2000	$ 800,000.00	4	6.00%	0.5	$ 12,000.00
					$ 14,000.00

2002 CAPACITOR

	Expense	Months	Rate	Weighting	Total
2001	$ 100,000.00	8	6.00%	0.5	$ 2,000.00
2002	$ 800,000.00	4	6.00%	0.5	$ 12,000.00
					$ 14,000.00

	AFUDC	CAPITAL	TOTAL
1996	$ 254,925.00	$ 7,440,000.00	$ 7,694,925.00
1997	$ 254,250.00	$ 3,700,000.00	$ 3,954,250.00
1998	$ 5,500.00	$ 270,000.00	$ 275,500.00
2000	$ 14,000.00	$ 700,000.00	$ 714,000.00
2002	$ 14,000.00	$ 700,000.00	$ 714,000.00
		$ 12,810,000.00	

PLAN B3 SEPARATE FERROSIL SUB

ROQUETTE SUB/CARBIDE MODS

	Expense	Months	Rate	Weighting	Total
1995	$ 475,000.00	6	6.00%	0.5	$ 7,125.00
1996	$ 4,915,000.00	12	6.00%	0.5	$ 175,950.00
					$ 183,075.00

FERROSIL SUB

	Expense	Months	Rate	Weighting	Total
1995	$ 30,000.00	6	6.00%	0.5	$ 450.00
1996	$ 80,000.00	12	6.00%	0.5	$ 4,200.00
1997	$ 1,260,000.00	12	6.00%	0.5	$ 44,400.00
					$ 49,050.00

161 LINES

	Expense	Months	Rate	Weighting	Total
1995	$ 250,000.00	6	6.00%	0.5	$ 3,750.00
1996	$ 1,950,000.00	12	6.00%	0.5	$ 73,500.00
1997	$ 1,500,000.00	12	6.00%	0.5	$ 177,000.00
					$ 254,250.00

69 lines

	Expense	Months	Rate	Weighting	Total
1995	$ 172,000.00	6	6.00%	0.5	$ 2,580.00
1996	$ 863,000.00	12	6.00%	0.5	$ 36,210.00
					$ 38,790.00

KEOKUK BREAKER/CARBIDE-MESSENGER 1 MILE 69 LINE

	Expense	Months	Rate	Weighting	Total
1995	$ 25,000.00	6	6.00%	0.5	$ 375.00
1996	$ 225,000.00	12	6.00%	0.5	$ 8,250.00
					$ 8,625.00

1998 CAPACITOR

	Expense	Months	Rate	Weighting	Total
1997	$ 40,000.00	8	6.00%	0.5	$ 800.00
1998	$ 230,000.00	4	6.00%	0.5	$ 4,700.00
					$ 5,500.00

2000 CAPACITOR

	Expense	Months	Rate	Weighting	Total
1999	$ 100,000.00	8	6.00%	0.5	$ 2,000.00
2000	$ 800,000.00	4	6.00%	0.5	$ 12,000.00
					$ 14,000.00

2002 CAPACITOR

	Expense	Months	Rate	Weighting	Total
2001	$ 100,000.00	8	6.00%	0.5	$ 2,000.00
2002	$ 800,000.00	4	6.00%	0.5	$ 12,000.00
					$ 14,000.00

	AFUDC	CAPITAL	TOTAL
1996	$ 230,480.00	$ 6,675,000.00	$ 6,905,480.00
1997	$ 303,300.00	$ 5,070,000.00	$ 5,373,300.00
1998	$ 5,500.00	$ 270,000.00	$ 275,500.00
2000	$ 14,000.00	$ 700,000.00	$ 714,000.00
2002	$ 14,000.00	$ 700,000.00	$ 714,000.00
		$ 13,415,000.00	

ANNUAL COST BREAKDOWN PROVIDED BY SUBSTATION AND TRANSMISSION ENGINEERING

PRESENT WORTH ANALYSIS FOR ELECTRIC PRODUCTION, TRANSMISSION AND DISTRIBUTION EQUIPMENT FOR IES 1995 FORECASTED COST OF MONEY

PROJECT NAME: PLAN B1 SEPARATE FERROSIL SUB

FIRST YEAR OF STUDY: 1995

Income Tax Rates:	Statutory	Effective
Federal Rate:	35.00%	31.46%
State Rate:	12.00%	10.11%
Composite Income Tax Rate:		41.57%

Debt & Equity Values	Amount		Rate		
Common Stock Equity:	46.58%	@	12.00%	Gives	5.59%
Preferred Stock:	1.61%	@	4.99%	Gives	0.08%
Long-Term Debt:	51.81%	@	7.34%	Gives	3.80%
			Weighted Cost of Capital Is:		9.47%

Pre-Tax Present Worth Rate Is: 13.51%

YEAR	INVESTMENT DESCRIPTION	PRODUCTION INVESTMENT	CARRYING CHARGE	TRANSMISSION INVESTMENT	CARRYING CHARGE	DISTRIBUTION INVESTMENT	CARRYING CHARGE	ANNUAL EXPENSES O & M	ANNUAL EXPENSES Misc.	TOTAL ANNUAL COST	PRESENT WORTH 13.51%	SUM OF PRESENT WORTH	Year
1995			$0		$0		$0			$0	$0	$0	1
1996			0	$6,350,075	1,029,017		0			1,029,017	798,660	798,660	
1997			0	$6,443,350	2,118,401		0			2,118,401	1,448,495	2,247,154	
1998			0	$275,500	2,176,485		0			2,176,485	1,311,095	3,558,249	
1999			0		2,114,280		0			2,114,280	1,122,046	4,680,295	5
2000			0	$714,000	2,166,878		0			2,166,878	1,013,100	5,693,394	
2001			0		2,111,207		0			2,111,207	869,597	6,562,991	
2002			0	$714,000	2,164,664		0			2,164,664	785,502	7,348,493	
2003			0		2,109,652		0			2,109,652	674,431	8,022,924	
2004			0		2,045,469		0			2,045,469	576,088	8,599,012	10
2005			0		1,979,691		0			1,979,691	491,205	9,090,217	
2006			0		1,913,744		0			1,913,744	418,330	9,508,547	
2007			0		1,848,009		0			1,848,009	355,884	9,864,432	
2008			0		1,782,214		0			1,782,214	302,367	10,166,799	
2009			0		1,716,486		0			1,716,486	256,557	10,423,356	15
2010			0		1,650,582		0			1,650,582	217,346	10,640,702	
2011			0		1,584,644		0			1,584,644	183,829	10,824,531	
2012			0		1,518,701		0			1,518,701	155,212	10,979,743	
2013			0		1,452,762		0			1,452,762	130,803	11,110,546	
2014			0		1,386,820		0			1,386,820	110,005	11,220,551	20
2015			0		1,320,881		0			1,320,881	92,305	11,312,856	
2016			0		1,274,225		0			1,274,225	78,447	11,391,303	
2017			0		1,253,834		0			1,253,834	68,005	11,459,308	
2018			0		1,228,489		0			1,228,489	58,701	11,518,009	
2019			0		1,190,665		0			1,190,665	50,122	11,568,131	25
2020			0		1,154,459		0			1,154,459	42,814	11,610,945	
2021			0		1,119,010		0			1,119,010	36,561	11,647,506	
2022			0		1,084,311		0			1,084,311	31,211	11,678,716	
2023			0		1,050,367		0			1,050,367	26,635	11,705,352	
2024			0		1,015,007		0			1,015,007	22,676	11,728,027	30
2025			0		979,647		0			979,647	19,281	11,747,308	
2026			0		944,287		0			944,287	16,373	11,763,681	
2027			0		908,927		0			908,927	13,884	11,777,566	
2028			0		873,568		0			873,568	11,756	11,789,322	
2029			0		837,735		0			837,735	9,932	11,799,254	35
2030			0		802,053		0			802,053	8,377	11,807,631	
2031			0		446,067		0			446,067	4,105	11,811,736	
2032			0		100,725		0			100,725	817	11,812,553	
2033			0		82,600		0			82,600	590	11,813,142	
2034			0		79,135		0			79,135	498	11,813,640	40
2035			0		39,532		0			39,532	219	11,813,859	
2036			0		37,808		0			37,808	185	11,814,044	
2037			0		0		0			0	0	11,814,044	
2038			0		0		0			0	0	11,814,044	
2039			$0		$0		$0			$0	$0	$11,814,044	45

ATTACHMENT 3

PRESENT WORTH ANALYSIS FOR ELECTRIC PRODUCTION, TRANSMISSION AND DISTRIBUTION EQUIPMENT
FOR IES 1995 FORECASTED COST OF MONEY

PROJECT NAME: PLAN B2 SEPARATE FERROSIL SUB

FIRST YEAR OF STUDY: 1995

Income Tax Rates:	Statutory	Effective
Federal Rate:	35.00%	31.46%
State Rate:	12.00%	10.11%
Composite Income Tax Rate:		41.57%

Debt & Equity Values	Amount		Rate		
Common Stock Equity:	46.58%	@	12.00%	Gives	5.59%
Preferred Stock:	1.61%	@	4.99%	Gives	0.08%
Long-Term Debt:	51.81%	@	7.34%	Gives	3.80%
			Weighted Cost of Capital Is:		9.47%

Pre-Tax Present Worth Rate Is: 13.51%

YEAR	INVESTMENT DESCRIPTION	PRODUCTION INVESTMENT	CARRYING CHARGE	TRANSMISSION INVESTMENT	CARRYING CHARGE	DISTRIBUTION INVESTMENT	CARRYING CHARGE	ANNUAL EXPENSES O & M	ANNUAL EXPENSES Misc.	TOTAL ANNUAL COST	PRESENT WORTH 13.51%	SUM OF PRESENT WORTH	Year
1995			$0		$0		$0			$0	$0	$0	1
1996			0	$7,753,465	1,256,433		0			1,256,433	975,166	975,166	
1997			0	$5,373,300	2,182,419		0			2,182,419	1,492,268	2,467,435	
1998			0	$275,500	2,225,699		0			2,225,699	1,340,741	3,808,176	
1999			0		2,162,069		0			2,162,069	1,147,408	4,955,583	5
2000			0	$714,000	2,213,292		0			2,213,292	1,034,800	5,990,383	
2001			0		2,156,283		0			2,156,283	888,164	6,878,547	
2002			0	$714,000	2,208,446		0			2,208,446	801,390	7,679,937	
2003			0		2,152,172		0			2,152,172	688,024	8,367,961	
2004			0		2,086,230		0			2,086,230	587,568	8,955,529	10
2005			0		2,018,881		0			2,018,881	500,929	9,456,458	
2006			0		1,951,416		0			1,951,416	426,565	9,883,023	
2007			0		1,884,167		0			1,884,167	362,848	10,245,871	
2008			0		1,816,853		0			1,816,853	308,244	10,554,114	
2009			0		1,749,612		0			1,749,612	261,508	10,815,623	15
2010			0		1,682,189		0			1,682,189	221,508	11,037,130	
2011			0		1,614,736		0			1,614,736	187,320	11,224,451	
2012			0		1,547,275		0			1,547,275	158,132	11,382,583	
2013			0		1,479,823		0			1,479,823	133,239	11,515,822	
2014			0		1,412,361		0			1,412,361	112,031	11,627,853	20
2015			0		1,344,909		0			1,344,909	93,984	11,721,837	
2016			0		1,300,997		0			1,300,997	80,095	11,801,933	
2017			0		1,281,583		0			1,281,583	69,510	11,871,443	
2018			0		1,253,304		0			1,253,304	59,886	11,931,329	
2019			0		1,214,666		0			1,214,666	51,133	11,982,461	25
2020			0		1,177,648		0			1,177,648	43,674	12,026,136	
2021			0		1,141,385		0			1,141,385	37,292	12,063,427	
2022			0		1,105,874		0			1,105,874	31,831	12,095,259	
2023			0		1,071,116		0			1,071,116	27,162	12,122,420	
2024			0		1,034,943		0			1,034,943	23,121	12,145,541	30
2025			0		998,770		0			998,770	19,657	12,165,198	
2026			0		962,597		0			962,597	16,691	12,181,889	
2027			0		926,425		0			926,425	14,152	12,196,041	
2028			0		890,252		0			890,252	11,981	12,208,021	
2029			0		853,501		0			853,501	10,119	12,218,140	35
2030			0		817,121		0			817,121	8,535	12,226,675	
2031			0		389,405		0			389,405	3,583	12,230,258	
2032			0		100,725		0			100,725	817	12,231,075	
2033			0		82,600		0			82,600	590	12,231,665	
2034			0		79,135		0			79,135	498	12,232,163	40
2035			0		39,532		0			39,532	219	12,232,382	
2036			0		37,808		0			37,808	185	12,232,567	
2037			0		0		0			0	0	12,232,567	
2038			0		0		0			0	0	12,232,567	
2039			$0		$0		$0			$0	$0	$12,232,567	45

ATTACHMENT 3

PRESENT WORTH ANALYSIS FOR ELECTRIC PRODUCTION, TRANSMISSION AND DISTRIBUTION EQUIPMENT FOR IES 1995 FORECASTED COST OF MONEY

PROJECT NAME: PLAN B3 SEPARATE FERROSIL SUB

FIRST YEAR OF STUDY: 1995

Income Tax Rates:	Statutory	Effective
Federal Rate:	35.00%	31.46%
State Rate:	12.00%	10.11%
Composite Income Tax Rate:		41.57%

Debt & Equity Values	Amount		Rate		
Common Stock Equity:	46.58%	@	12.00%	Gives	5.59%
Preferred Stock:	1.61%	@	4.99%	Gives	0.08%
Long-Term Debt:	51.81%	@	7.34%	Gives	3.80%
			Weighted Cost of Capital Is:		9.47%

Pre-Tax Present Worth Rate Is: 13.51%

YEAR	INVESTMENT DESCRIPTION	PRODUCTION INVESTMENT	CARRYING CHARGE	TRANSMISSION INVESTMENT	CARRYING CHARGE	DISTRIBUTION INVESTMENT	CARRYING CHARGE	ANNUAL EXPENSES O & M	ANNUAL EXPENSES Misc.	TOTAL ANNUAL COST	PRESENT WORTH 13.51%	SUM OF PRESENT WORTH	Year
1995			$0		$0		$0			$0	$0	$0	1
1996			0	$6,905,490	1,119,021		0			1,119,021	868,515	868,515	
1997			0	$5,373,300	2,038,963		0			2,038,963	1,394,178	2,262,693	
1998			0	$275,500	2,086,581		0			2,086,581	1,256,937	3,519,631	
1999			0		2,027,119		0			2,027,119	1,075,790	4,595,420	5
2000			0	$714,000	2,082,351		0			2,082,351	973,580	5,569,000	
2001			0		2,029,207		0			2,029,207	835,822	6,404,822	
2002			0	$714,000	2,085,099		0			2,085,099	756,630	7,161,451	
2003			0		2,032,431		0			2,032,431	649,744	7,811,195	
2004			0		1,970,301		0			1,970,301	554,918	8,366,113	10
2005			0		1,906,807		0			1,906,807	473,121	8,839,234	
2006			0		1,843,200		0			1,843,200	402,910	9,242,144	
2007			0		1,779,808		0			1,779,808	342,750	9,584,894	
2008			0		1,716,352		0			1,716,352	291,193	9,876,087	
2009			0		1,652,966		0			1,652,966	247,063	10,123,150	15
2010			0		1,589,402		0			1,589,402	209,289	10,332,440	
2011			0		1,525,805		0			1,525,805	177,004	10,509,444	
2012			0		1,462,202		0			1,462,202	149,438	10,658,881	
2013			0		1,398,606		0			1,398,606	125,927	10,784,808	
2014			0		1,335,002		0			1,335,002	105,895	10,890,703	20
2015			0		1,271,406		0			1,271,406	88,848	10,979,551	
2016			0		1,228,777		0			1,228,777	75,649	11,055,200	
2017			0		1,209,750		0			1,209,750	65,614	11,120,814	
2018			0		1,183,539		0			1,183,539	56,553	11,177,366	
2019			0		1,146,970		0			1,146,970	48,283	11,225,649	25
2020			0		1,112,020		0			1,112,020	41,240	11,266,890	
2021			0		1,077,825		0			1,077,825	35,215	11,302,105	
2022			0		1,044,382		0			1,044,382	30,061	11,332,166	
2023			0		1,011,693		0			1,011,693	25,655	11,357,821	
2024			0		977,589		0			977,589	21,840	11,379,660	30
2025			0		943,484		0			943,484	18,569	11,398,229	
2026			0		909,379		0			909,379	15,768	11,413,997	
2027			0		875,275		0			875,275	13,370	11,427,368	
2028			0		841,170		0			841,170	11,320	11,438,688	
2029			0		806,551		0			806,551	9,562	11,448,250	35
2030			0		772,218		0			772,218	8,066	11,456,316	
2031			0		389,405		0			389,405	3,583	11,459,899	
2032			0		100,725		0			100,725	817	11,460,716	
2033			0		82,600		0			82,600	590	11,461,306	
2034			0		79,135		0			79,135	498	11,461,803	40
2035			0		39,532		0			39,532	219	11,462,023	
2036			0		37,808		0			37,808	185	11,462,207	
2037			0		0		0			0	0	11,462,207	
2038			0		0		0			0	0	11,462,207	
2039			$0		$0		$0			$0	$0	$11,462,207	45

ATTACHMENT 3

PRESENT WORTH ANALYSIS FOR ELECTRIC PRODUCTION, TRANSMISSION AND DISTRIBUTION EQUIPMENT FOR IES 1995 FORECASTED COST OF MONEY

PROJECT NAME: PLAN B1 COMBINED ROQUETTE/FERROSIL SUB

FIRST YEAR OF STUDY: 1995

Income Tax Rates:	Statutory	Effective
Federal Rate:	35.00%	31.46%
State Rate:	12.00%	10.11%
Composite Income Tax Rate:		41.57%

Debt & Equity Values	Amount		Rate		
Common Stock Equity:	46.58%	@	12.00%	Gives	5.59%
Preferred Stock:	1.61%	@	4.99%	Gives	0.08%
Long-Term Debt:	51.81%	@	7.34%	Gives	3.80%
			Weighted Cost of Capital Is:		9.47%

Pre-Tax Present Worth Rate Is: 13.51%

YEAR	INVESTMENT DESCRIPTION	PRODUCTION INVESTMENT	CARRYING CHARGE	TRANSMISSION INVESTMENT	CARRYING CHARGE	DISTRIBUTION INVESTMENT	CARRYING CHARGE	ANNUAL EXPENSES O & M	ANNUAL EXPENSES Misc	TOTAL ANNUAL COST	PRESENT WORTH 13.51%	SUM OF PRESENT WORTH	Year
1995			$0		$0		$0			$0	$0	$0	1
1996			0	$7,380,075	1,195,926		0			1,195,926	928,204	928,204	
1997			0	$4,661,800	2,003,954		0			2,003,954	1,370,240	2,298,444	
1998			0	$275,500	2,044,074		0			2,044,074	1,231,332	3,529,775	
1999			0		1,985,918		0			1,985,918	1,053,924	4,583,700	5
2000			0	$714,000	2,042,403		0			2,042,403	954,903	5,538,603	
2001			0		1,990,461		0			1,990,461	819,862	6,358,465	
2002			0	$714,000	2,047,508		0			2,047,508	742,989	7,101,454	
2003			0		1,995,951		0			1,995,951	638,082	7,739,535	
2004			0		1,934,713		0			1,934,713	544,895	8,284,430	10
2005			0		1,872,259		0			1,872,259	464,549	8,748,979	
2006			0		1,809,729		0			1,809,729	395,593	9,144,572	
2007			0		1,747,415		0			1,747,415	336,512	9,481,085	
2008			0		1,685,035		0			1,685,035	285,880	9,766,965	
2009			0		1,622,729		0			1,622,729	242,544	10,009,508	15
2010			0		1,560,241		0			1,560,241	205,450	10,214,958	
2011			0		1,497,724		0			1,497,724	173,746	10,388,704	
2012			0		1,435,196		0			1,435,196	146,678	10,535,382	
2013			0		1,372,679		0			1,372,679	123,592	10,658,974	
2014			0		1,310,152		0			1,310,152	103,924	10,762,898	20
2015			0		1,247,635		0			1,247,635	87,187	10,850,084	
2016			0		1,207,523		0			1,207,523	74,341	10,924,425	
2017			0		1,189,356		0			1,189,356	64,508	10,988,933	
2018			0		1,162,312		0			1,162,312	55,538	11,044,471	
2019			0		1,126,321		0			1,126,321	47,414	11,091,885	25
2020			0		1,091,949		0			1,091,949	40,496	11,132,381	
2021			0		1,058,332		0			1,058,332	34,578	11,166,959	
2022			0		1,025,467		0			1,025,467	29,517	11,196,476	
2023			0		993,356		0			993,356	25,190	11,221,666	
2024			0		959,829		0			959,829	21,443	11,243,108	30
2025			0		926,302		0			926,302	18,231	11,261,339	
2026			0		892,775		0			892,775	15,480	11,276,819	
2027			0		859,249		0			859,249	13,126	11,289,945	
2028			0		825,722		0			825,722	11,112	11,301,057	
2029			0		791,646		0			791,646	9,386	11,310,443	35
2030			0		757,955		0			757,955	7,917	11,318,359	
2031			0		351,729		0			351,729	3,237	11,321,596	
2032			0		100,725		0			100,725	817	11,322,413	
2033			0		82,600		0			82,600	590	11,323,003	
2034			0		79,135		0			79,135	498	11,323,500	40
2035			0		39,532		0			39,532	219	11,323,720	
2036			0		37,808		0			37,808	185	11,323,904	
2037			0		0		0			0	0	11,323,904	
2038			0		0		0			0	0	11,323,904	
2039			$0		$0		$0			$0	$0	$11,323,904	45

ATTACHMENT 3

PRESENT WORTH ANALYSIS FOR ELECTRIC PRODUCTION, TRANSMISSION AND DISTRIBUTION EQUIPMENT
FOR IES 1995 FORECASTED COST OF MONEY

PROJECT NAME: PLAN B2 COMBINED ROQUETTE/FERROSIL SUB

FIRST YEAR OF STUDY: 1995

Income Tax Rates:	Statutory	Effective
Federal Rate:	35.00%	31.46%
State Rate:	12.00%	10.11%
Composite Income Tax Rate:		41.57%

Debt & Equity Values	Amount		Rate		
Common Stock Equity:	46.58%	@	12.00%	Gives	5.59%
Preferred Stock:	1.61%	@	4.99%	Gives	0.08%
Long-Term Debt:	51.81%	@	7.34%	Gives	3.80%
			Weighted Cost of Capital Is:		9.47%

Pre-Tax Present Worth Rate Is: 13.51%

YEAR	INVESTMENT DESCRIPTION	PRODUCTION INVESTMENT	CARRYING CHARGE	TRANSMISSION INVESTMENT	CARRYING CHARGE	DISTRIBUTION INVESTMENT	CARRYING CHARGE	ANNUAL EXPENSES O & M	ANNUAL EXPENSES Misc.	TOTAL ANNUAL COST	PRESENT WORTH 13.51%	SUM OF PRESENT WORTH	Year
1995			$0		$0		$0			$0	$0	$0	
1996			0	$8,576,890	1,389,868		0			1,389,868	1,078,730	1,078,730	1
1997			0	$3,954,250	2,091,767		0			2,091,767	1,430,283	2,509,013	
1998			0	$275,500	2,120,724		0			2,120,724	1,277,505	3,786,518	
1999			0		2,060,304		0			2,060,304	1,093,401	4,879,919	5
2000			0	$714,000	2,114,609		0			2,114,609	988,662	5,868,580	
2001			0		2,060,556		0			2,060,556	848,734	6,717,315	
2002			0	$714,000	2,115,566		0			2,115,566	767,686	7,485,000	
2003			0		2,062,031		0			2,062,031	659,207	8,144,207	
2004			0		1,998,421		0			1,998,421	562,838	8,707,044	10
2005			0		1,933,706		0			1,933,706	479,796	9,186,840	
2006			0		1,868,948		0			1,868,948	408,538	9,595,378	
2007			0		1,804,411		0			1,804,411	347,488	9,942,866	
2008			0		1,739,804		0			1,739,804	295,172	10,238,038	
2009			0		1,675,274		0			1,675,274	250,397	10,488,435	15
2010			0		1,610,558		0			1,610,558	212,075	10,700,511	
2011			0		1,545,817		0			1,545,817	179,325	10,879,836	
2012			0		1,481,063		0			1,481,063	151,365	11,031,201	
2013			0		1,416,322		0			1,416,322	127,522	11,158,723	
2014			0		1,351,567		0			1,351,567	107,209	11,265,932	20
2015			0		1,286,827		0			1,286,827	89,925	11,355,857	
2016			0		1,248,123		0			1,248,123	76,840	11,432,697	
2017			0		1,230,479		0			1,230,479	66,738	11,499,436	
2018			0		1,200,839		0			1,200,839	57,379	11,556,815	
2019			0		1,163,654		0			1,163,654	48,985	11,605,800	25
2020			0		1,128,089		0			1,128,089	41,836	11,647,636	
2021			0		1,093,279		0			1,093,279	35,720	11,683,356	
2022			0		1,059,220		0			1,059,220	30,488	11,713,845	
2023			0		1,025,916		0			1,025,916	26,015	11,739,860	
2024			0		991,196		0			991,196	22,144	11,762,004	30
2025			0		956,476		0			956,476	18,825	11,780,829	
2026			0		921,755		0			921,755	15,982	11,796,811	
2027			0		887,035		0			887,035	13,550	11,810,361	
2028			0		852,315		0			852,315	11,470	11,821,831	
2029			0		816,956		0			816,956	9,686	11,831,517	35
2030			0		782,154		0			782,154	8,170	11,839,686	
2031			0		314,262		0			314,262	2,892	11,842,578	
2032			0		100,725		0			100,725	817	11,843,395	
2033			0		82,600		0			82,600	590	11,843,985	
2034			0		79,135		0			79,135	498	11,844,483	40
2035			0		39,532		0			39,532	219	11,844,702	
2036			0		37,808		0			37,808	185	11,844,886	
2037			0		0		0			0	0	11,844,886	
2038			0		0		0			0	0	11,844,886	
2039			$0		$0		$0			$0	$0	$11,844,886	45

ATTACHMENT 3

PRESENT WORTH ANALYSIS FOR ELECTRIC PRODUCTION, TRANSMISSION AND DISTRIBUTION EQUIPMENT FOR IES 1995 FORECASTED COST OF MONEY

PROJECT NAME : PLAN B3 COMBINED ROQUETTE/FERROSIL SUB

FIRST YEAR OF STUDY : 1995

Income Tax Rates:	Statutory	Effective
Federal Rate:	35.00%	31.46%
State Rate:	12.00%	10.11%
Composite Income Tax Rate:		41.57%

Debt & Equity Values	Amount		Rate		
Common Stock Equity:	46.58%	@	12.00%	Gives	5.59%
Preferred Stock:	1.61%	@	4.99%	Gives	0.08%
Long-Term Debt:	51.81%	@	7.34%	Gives	3.80%
			Weighted Cost of Capital Is:		9.47%

Pre-Tax Present Worth Rate Is: 13.51%

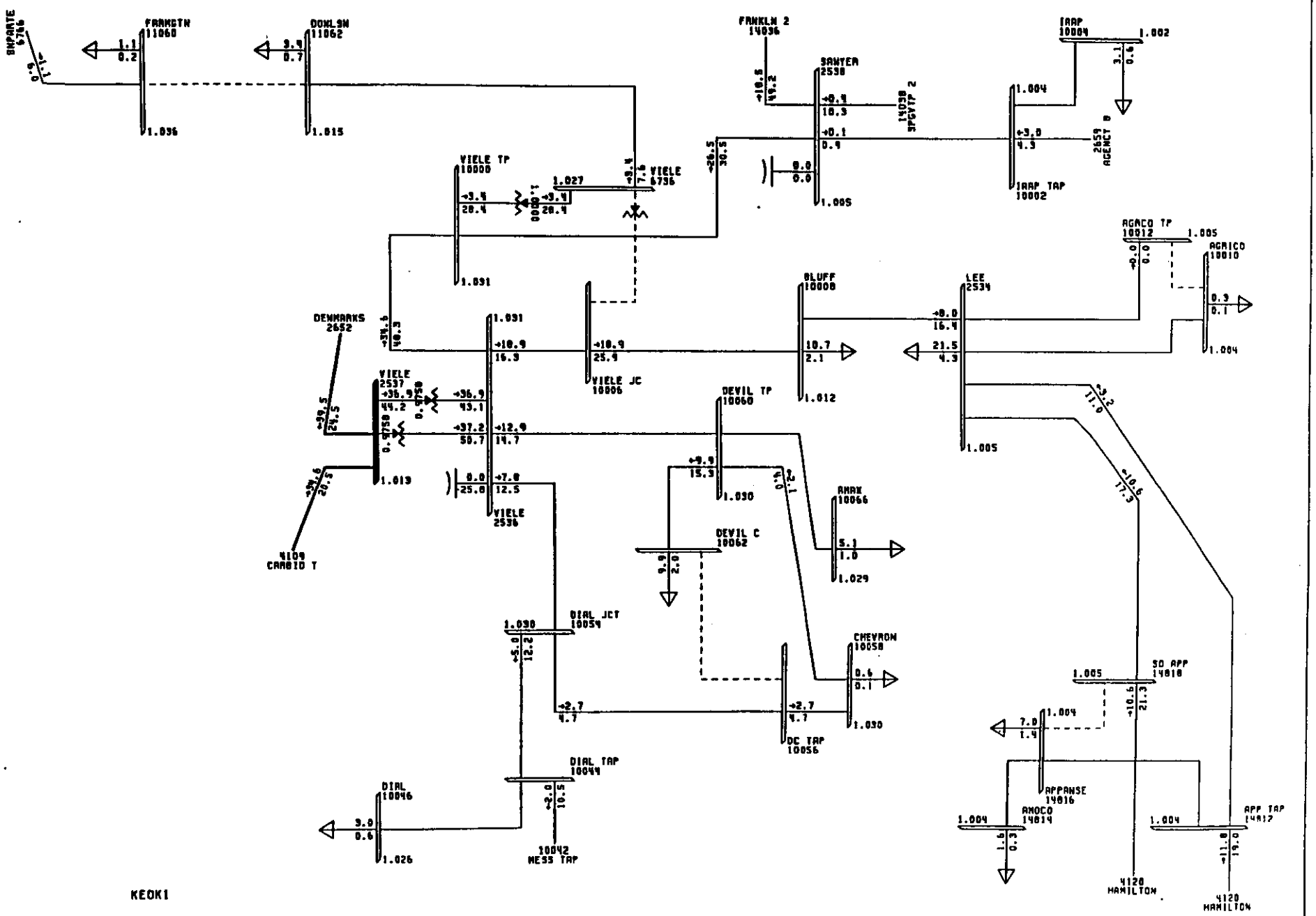
YEAR	INVESTMENT DESCRIPTION	PRODUCTION INVESTMENT	CARRYING CHARGE	TRANSMISSION INVESTMENT	CARRYING CHARGE	DISTRIBUTION INVESTMENT	CARRYING CHARGE	ANNUAL EXPENSES O & M	ANNUAL EXPENSES Misc.	TOTAL ANNUAL COST	PRESENT WORTH 13.51%	SUM OF PRESENT WORTH	Year
1995			$0		$0		$0			$0	$0	$0	1
1996			0	$7,694,925	1,246,947		0			1,246,947	967,804	967,804	
1997			0	$3,954,250	1,942,561		0			1,942,561	1,328,261	2,296,065	
1998			0	$275,500	1,976,029		0			1,976,029	1,190,342	3,486,407	
1999			0		1,919,944		0			1,919,944	1,018,912	4,505,319	5
2000			0	$714,000	1,978,419		0			1,978,419	924,988	5,430,306	
2001			0		1,928,386		0			1,928,386	794,294	6,224,600	
2002			0	$714,000	1,987,274		0			1,987,274	721,132	6,945,732	
2003			0		1,937,489		0			1,937,489	619,392	7,565,124	
2004			0		1,877,844		0			1,877,844	528,878	8,094,002	10
2005			0		1,817,140		0			1,817,140	450,873	8,544,875	
2006			0		1,756,394		0			1,756,394	383,935	8,928,810	
2007			0		1,695,868		0			1,695,868	326,586	9,255,396	
2008			0		1,635,274		0			1,635,274	277,437	9,532,833	
2009			0		1,574,755		0			1,574,755	235,373	9,768,206	15
2010			0		1,514,052		0			1,514,052	199,368	9,967,574	
2011			0		1,453,322		0			1,453,322	168,595	10,136,169	
2012			0		1,392,580		0			1,392,580	142,322	10,278,491	
2013			0		1,331,850		0			1,331,850	119,916	10,398,407	
2014			0		1,271,108		0			1,271,108	100,826	10,499,234	20
2015			0		1,210,378		0			1,210,378	84,583	10,583,817	
2016			0		1,173,008		0			1,173,008	72,216	10,656,033	
2017			0		1,155,766		0			1,155,766	62,686	10,718,719	
2018			0		1,128,278		0			1,128,278	53,912	10,772,631	
2019			0		1,093,245		0			1,093,245	46,021	10,818,652	25
2020			0		1,059,830		0			1,059,830	39,305	10,857,957	
2021			0		1,027,172		0			1,027,172	33,560	10,891,517	
2022			0		995,264		0			995,264	28,648	10,920,164	
2023			0		964,111		0			964,111	24,448	10,944,613	
2024			0		931,542		0			931,542	20,811	10,965,423	30
2025			0		898,973		0			898,973	17,693	10,983,117	
2026			0		866,404		0			866,404	15,023	10,998,139	
2027			0		833,835		0			833,835	12,737	11,010,877	
2028			0		801,266		0			801,266	10,783	11,021,660	
2029			0		768,124		0			768,124	9,107	11,030,767	35
2030			0		735,452		0			735,452	7,682	11,038,448	
2031			0		314,262		0			314,262	2,892	11,041,340	
2032			0		100,725		0			100,725	817	11,042,157	
2033			0		82,600		0			82,600	590	11,042,747	
2034			0		79,135		0			79,135	498	11,043,244	40
2035			0		39,532		0			39,532	219	11,043,464	
2036			0		37,808		0			37,808	185	11,043,648	
2037			0		0		0			0	0	11,043,648	
2038			0		0		0			0	0	11,043,648	
2039			$0		$0		$0			$0	$0	$11,043,648	45

ATTACHMENT 3

LOADFLOW INDEX

CASE	DESCRIPTION
1996C ADDITIONAL 7MW AT ROQUETTE BASE CASE AND 3 CONTINGENCIES	16 MW FERROSIL AT WEST KEOKUK, INCREASE OF 7MW AT ROQUETTE
1998B 161KV PLAN BASE CASE AND 7 CONTINGENCIES	PLAN B1 EXCLUDING NEW CARBIDE-MESSENGER LINE AND CAPACITOR ADDITIONS
1998B 69KV PLAN BASE CASE AND 7 CONTINGENCIES	PLAN B2 EXCLUDING NEW CARBIDE-MESSENGER LINE AND CAPACITOR ADDITIONS
2006B 161KV PLAN BASE CASE AND 7 CONTINGENCIES	PLAN B1 EXCLUDING NEW CARBIDE-MESSENGER LINE AND CAPACITOR ADDITIONS
2006B 69KV PLAN BASE CASE AND 7 CONTINGENCIES	PLAN B2 EXCLUDING NEW CARBIDE-MESSENGER LINE AND CAPACITOR ADDITIONS
1998B 161KV PLAN, NEW CARB-MESS LINE, 24.3MVARS BGS BASE CASE AND 7 CONTINGENCIES	PLAN B1 IMPLEMENTED EXCEPT 50MVAR AT CARBIDE AND BGS 161KV
1998B 69KV PLAN, NEW CARB-MESS LINE, 24.3MVARS BGS 69 BASE CASE AND 7 CONTINGENCIES	PLAN B2 IMPLEMENTED EXCEPT 50MVAR AT CARBIDE AND BGS 161KV
2006B 161KV PLAN, NEW CARB-MESS LINE, ALL CAPS BASE CASE AND 7 CONTINGENCIES	PLAN B1 FULLY IMPLEMENTED
2006B 69KV PLAN, NEW CARB-MESS LINE, ALL CAPS BASE CASE AND 7 CONTINGENCIES	PLAN B2 FULLY IMPLEMENTED

ATTACHMENT 4

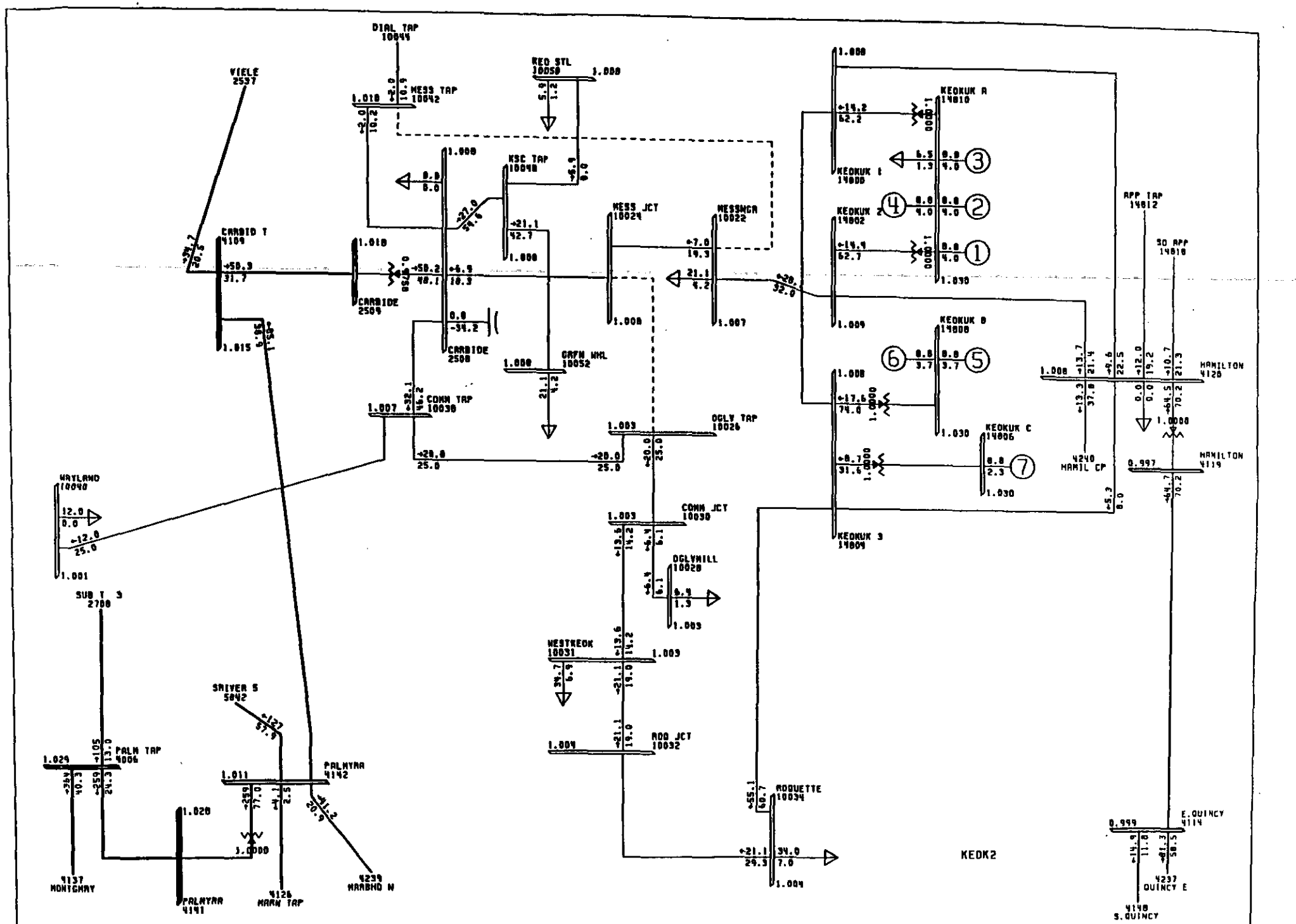


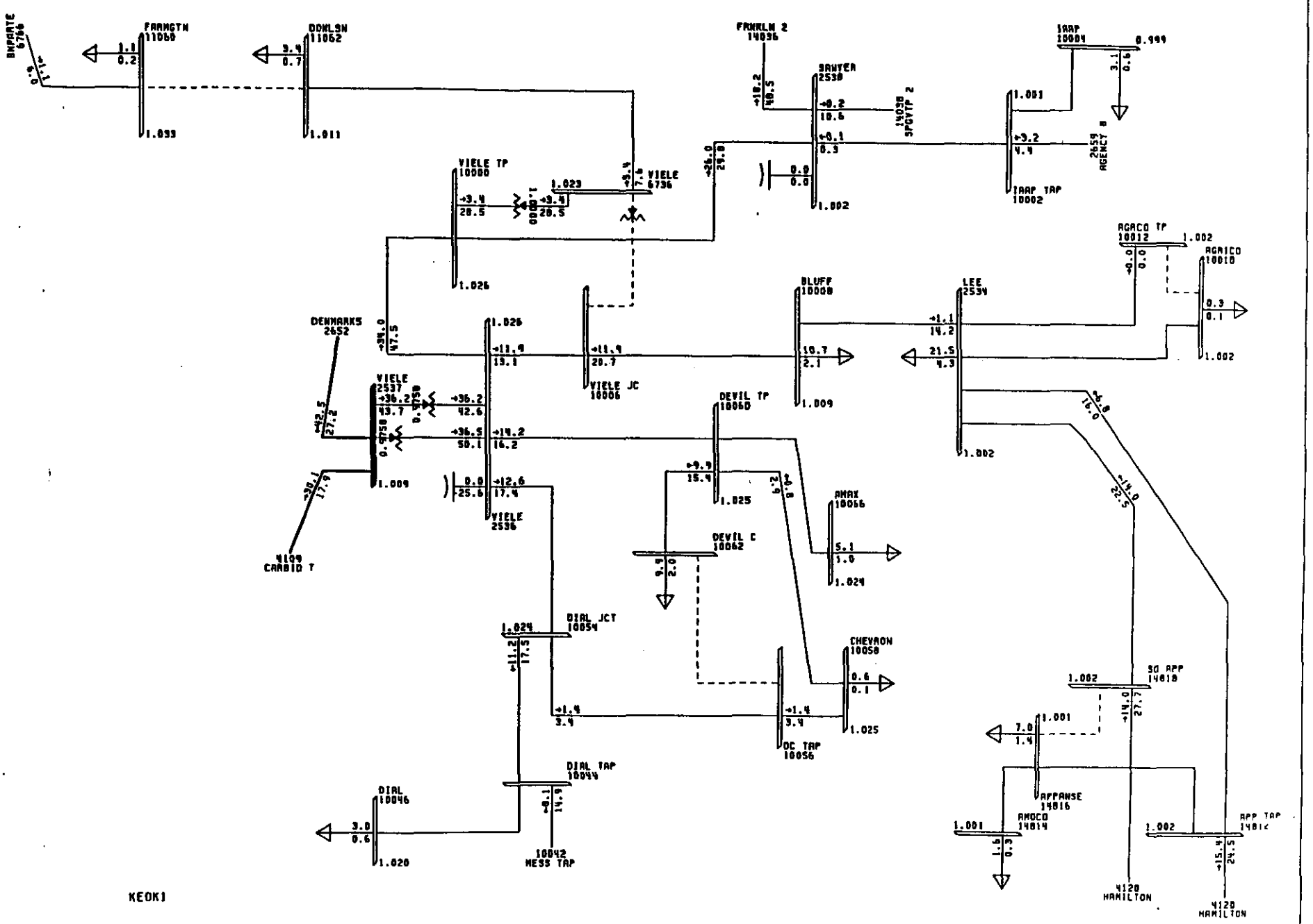
1996C ADDITIONAL 7MW AT ROQUETTE, 16MW FERROSIL AT WEST KEO
BASE CASE
MON, JUN 05 1995 08:23

POWER TECHNOLOGIES, INC.

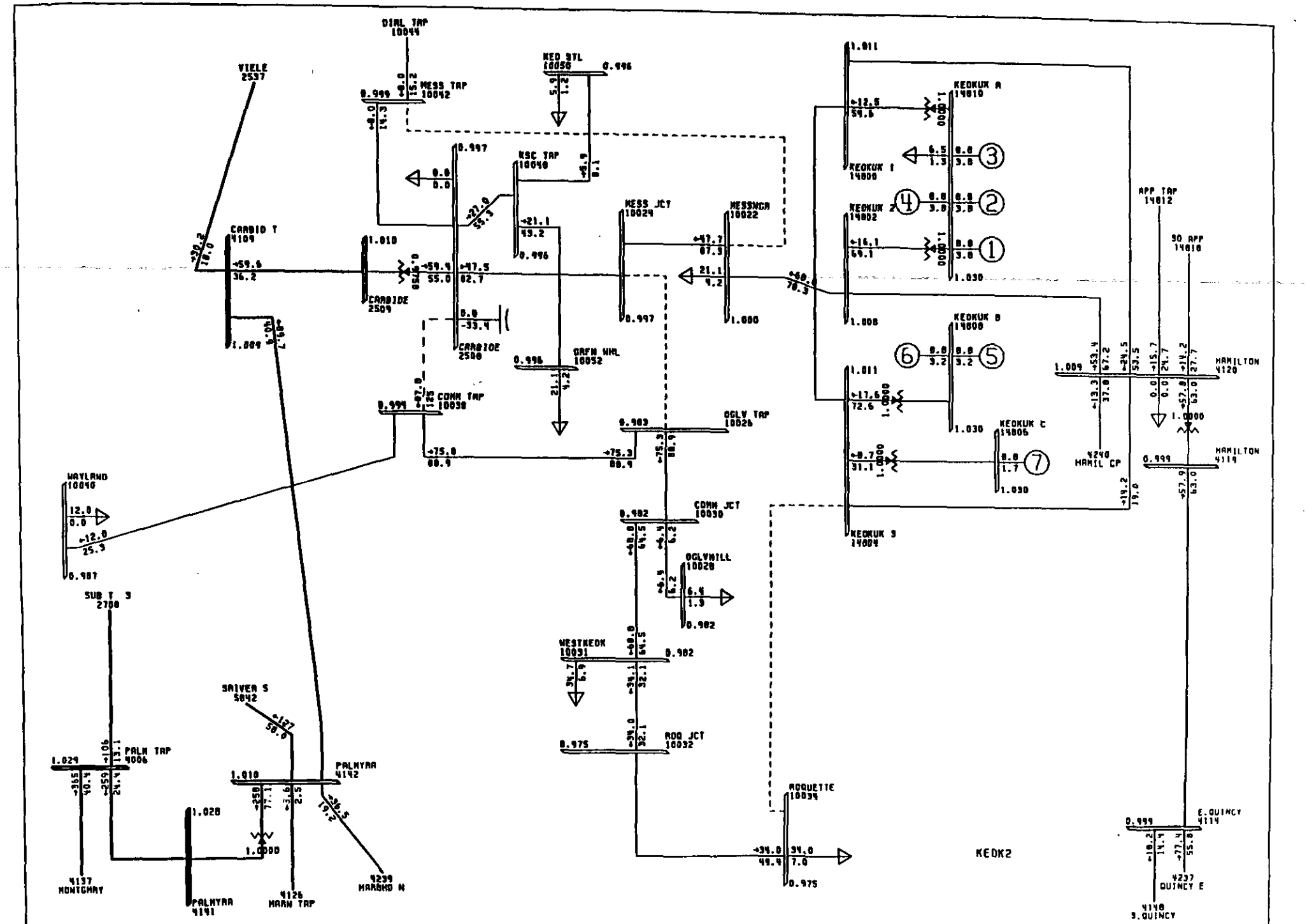
100% RATEA
0.925UV 1.060 OV
KV: ≤72 , ≤141 , ≤167

BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR


DIAL TAP
10044
VIELE
2537
MESS TAP
10042
KEO STL
10058
KSC TAP
10048
CARBID T
4109
CARBIDE
2509
CARBIDE
2508
MESS JCT
10024
MESSNGR
10022
GRFN WHL
10052
CONN TAP
10030
OGLY TAP
10026
CONN JCT
10030
OGLYHILL
10028
ROQ JCT
10032
WESTKEOK
10031
ROQUETTE
10034
KEOKUK A
14810
KEOKUK 1
14800
KEOKUK 2
14802
KEOKUK B
14808
KEOKUK C
14806
KEOKUK 3
14804
APP TAP
14812
SO APP
14818
HAMILTON
4120
HAMILTON
4119
4240
HAMIL CP
E.QUINCY
4114
4237
QUINCY E
4148
S.QUINCY
WAYLAND
10040
SUB T 3
2708
PALM TAP
4006
SRIVER S
5042
PALMYRA
4142
PALMYRA
4141
4126
MARK TAP
4239
WARSHO N
9137
MONTGMRY
KEDK2
1996C ADDITIONAL 7MW AT ROQUETTE, 16MW FERROSIL AT WEST KEO
BASE CASE
100% RATER
0.925UV 1.060OV
BUS - VOLTAGE(PU)
BRANCH - MW/% OF RATE A



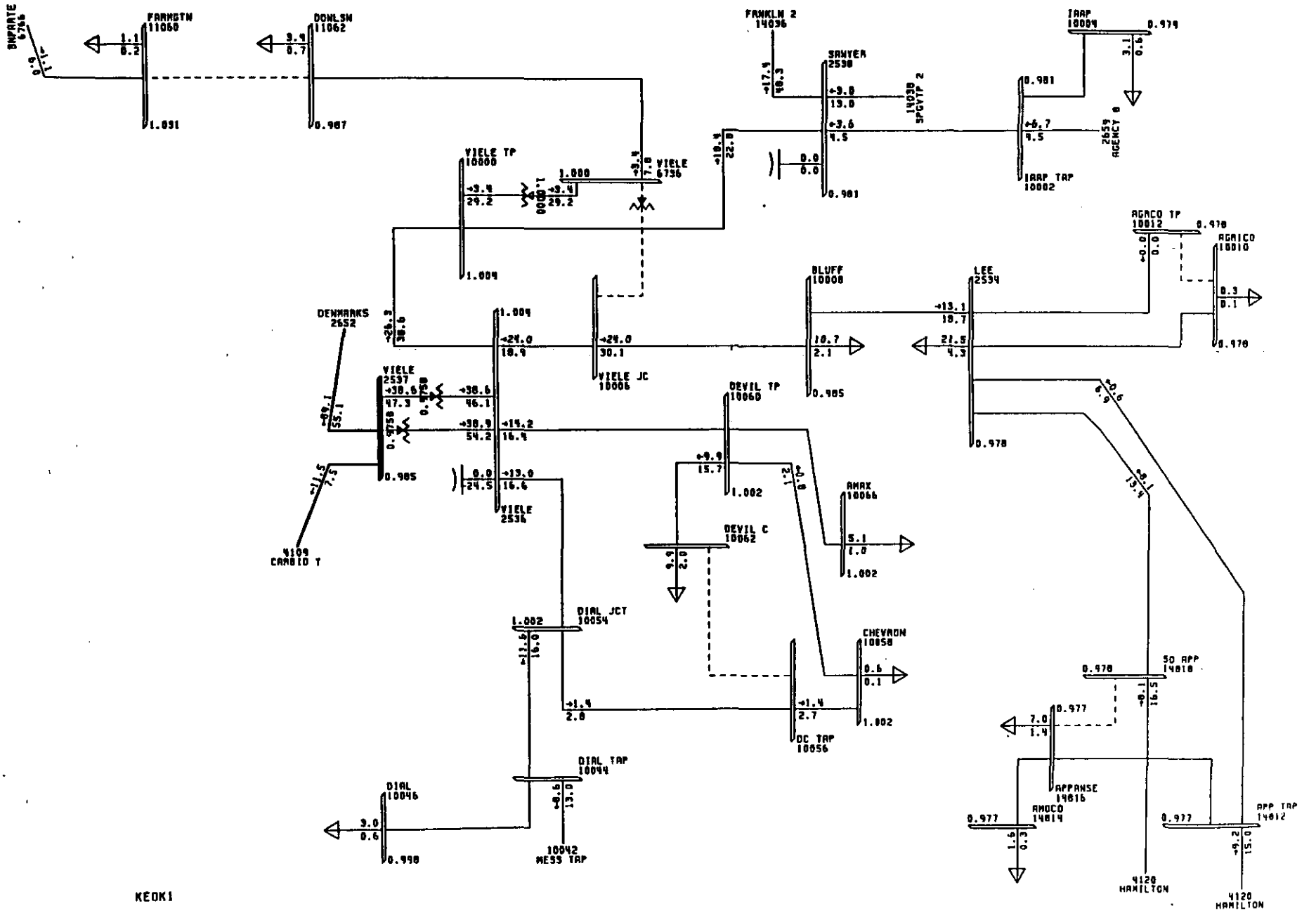
POWER TECHNOLOGIES, INC.	1996C ADDITIONAL 7MW AT ROQUETTE, 16MW FERROSIL AT WEST KEO CONT 1: LOSS OF NEW HYDRO-ROQUETTE LINE MON, JUN 05 1995 08:24	100% RATE 0.925 UV 1.060 OV KV: ≤72 , ≤141 , ≤167	BUS - VOLTAGE (PU) BRANCH - MW/% OF RATE A EQUIPMENT - MW/MVAR



1996C ADDITIONAL 7MW AT ROQUETTE, 16MW FERROSIL AT WEST KEO
CONT 1: LOSS OF NEW HYDRO-ROQUETTE LINE

100% RATEA
0.925UV 1.060OV

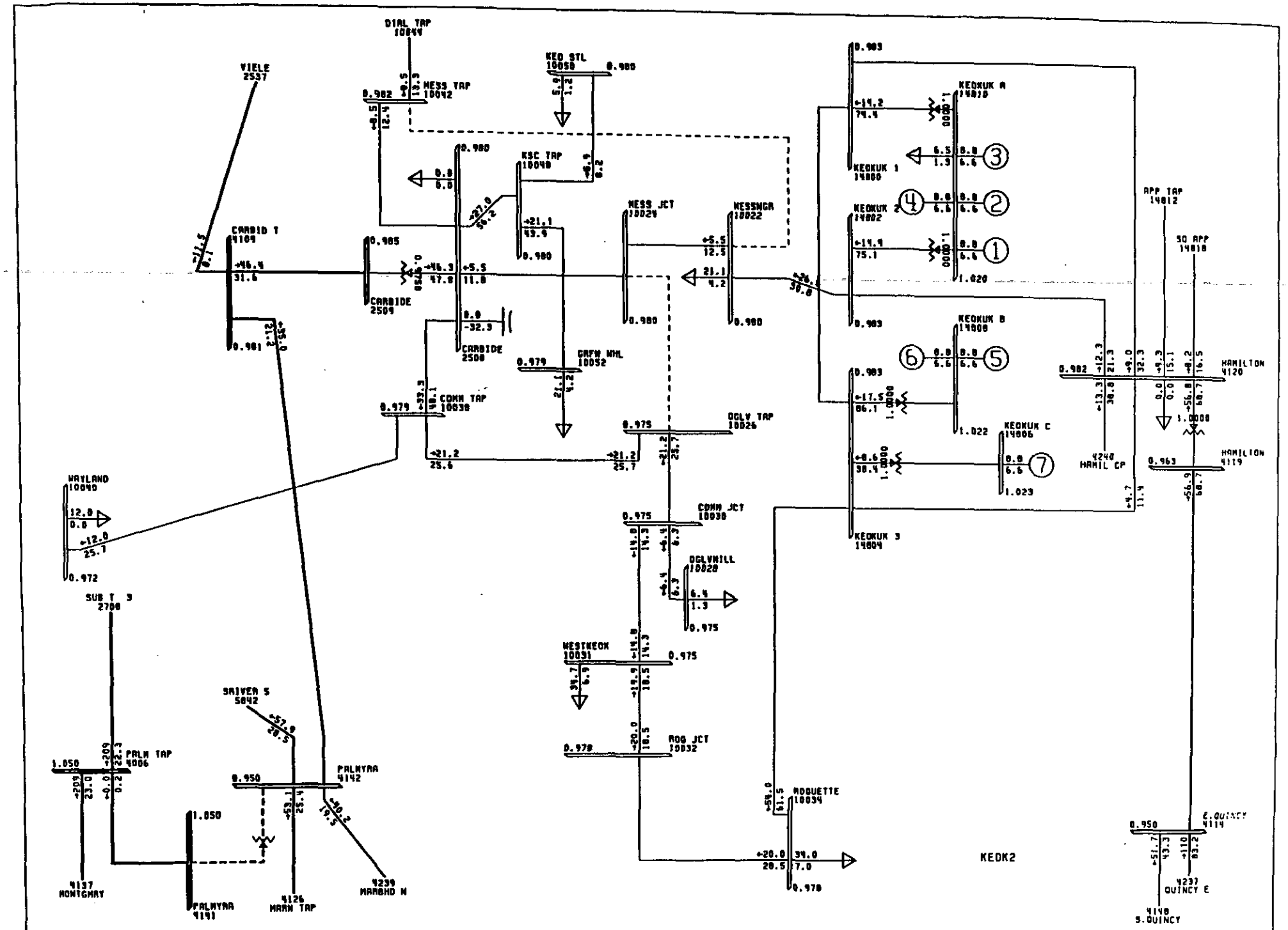
BUS - VOLTAGE(PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



1996C ADDITIONAL 7MW AT ROQUETTE, 16MW FERROSIL AT WEST KEO
CONT 2: LOSS OF PALMYRA 345/161
MON TUN 05 1995 08:24

100% RATEA
0.925 UV 1.060 OV
KV: ≤72 , ≤141 , ≤167

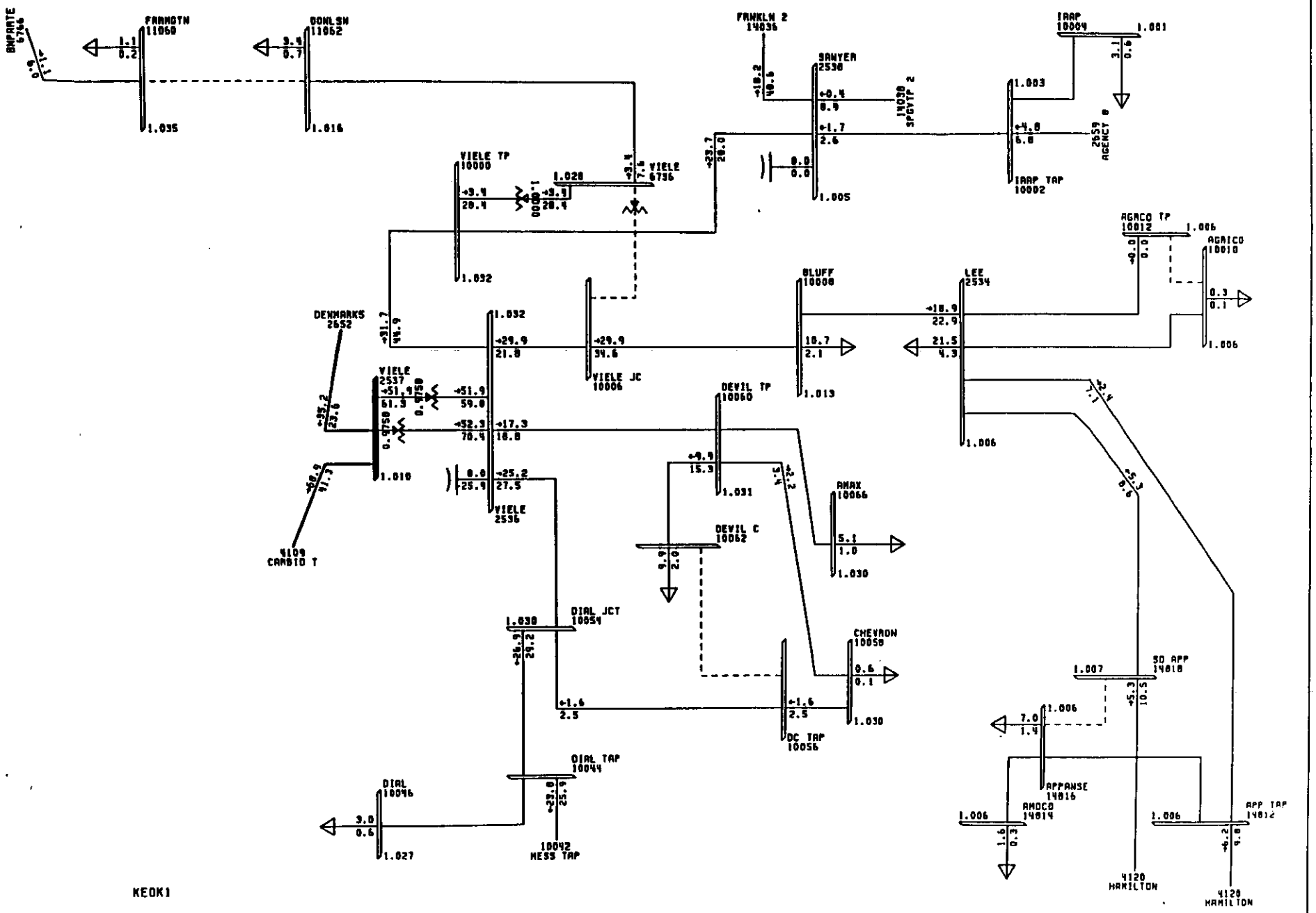
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



1996C ADDITIONAL 7MW AT ROQUETTE, 16MW FERROSIL AT WEST KEO
CONT 2: LOSS OF PALMYRA 345/161

100% RATEA
0.925UV 1.060OV

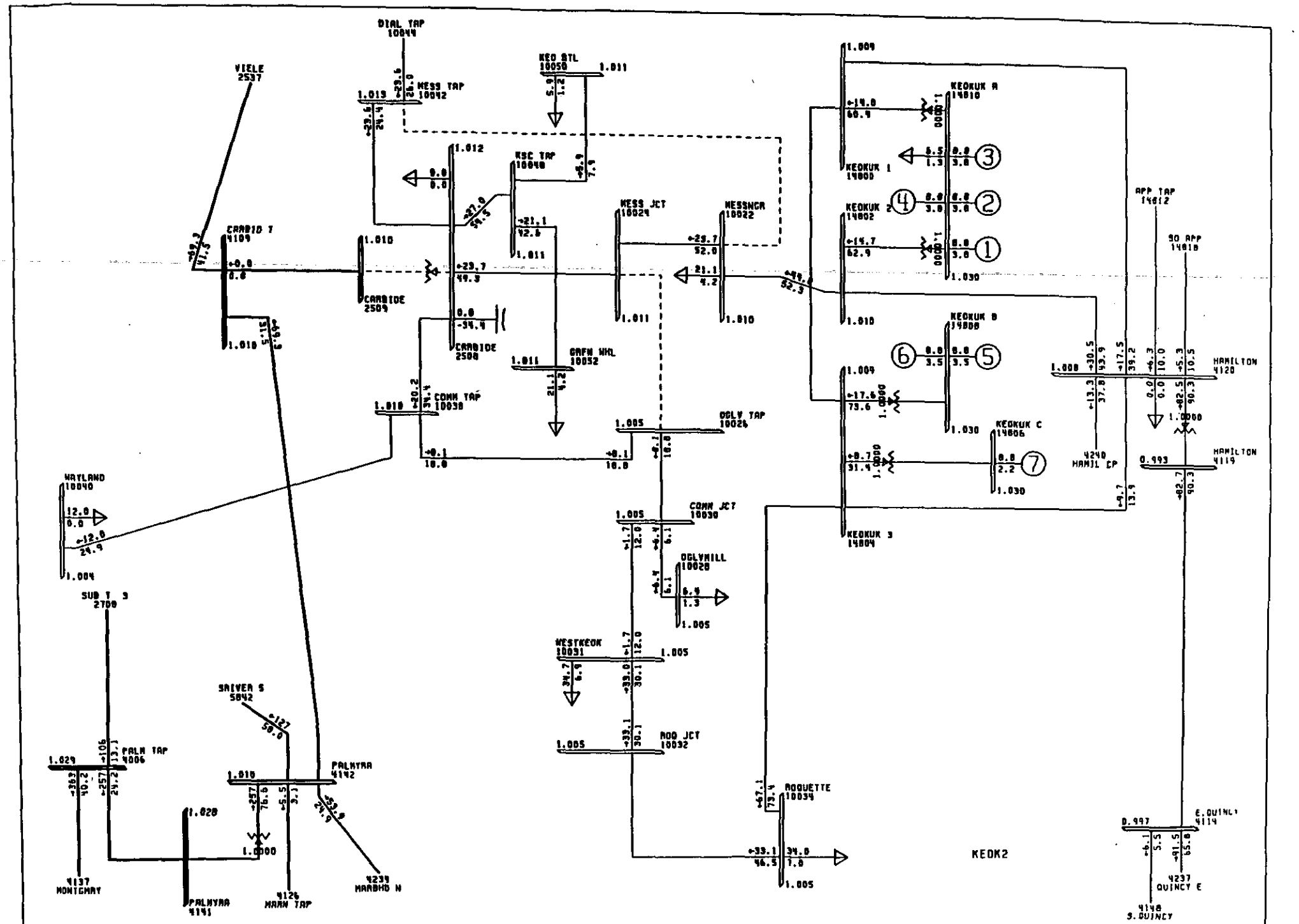
BUS - VOLTAGE(PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



1996C ADDITIONAL 7MW AT ROQUETTE, 16MW FERROSIL AT WEST KEO
CONT 3: LOSS OF CARBIDE XFMR
MON JUN 05 1995 08:24

100% RATEA
0.925 UV 1.060 OV
KV: ≤72 , ≤141 , ≤167

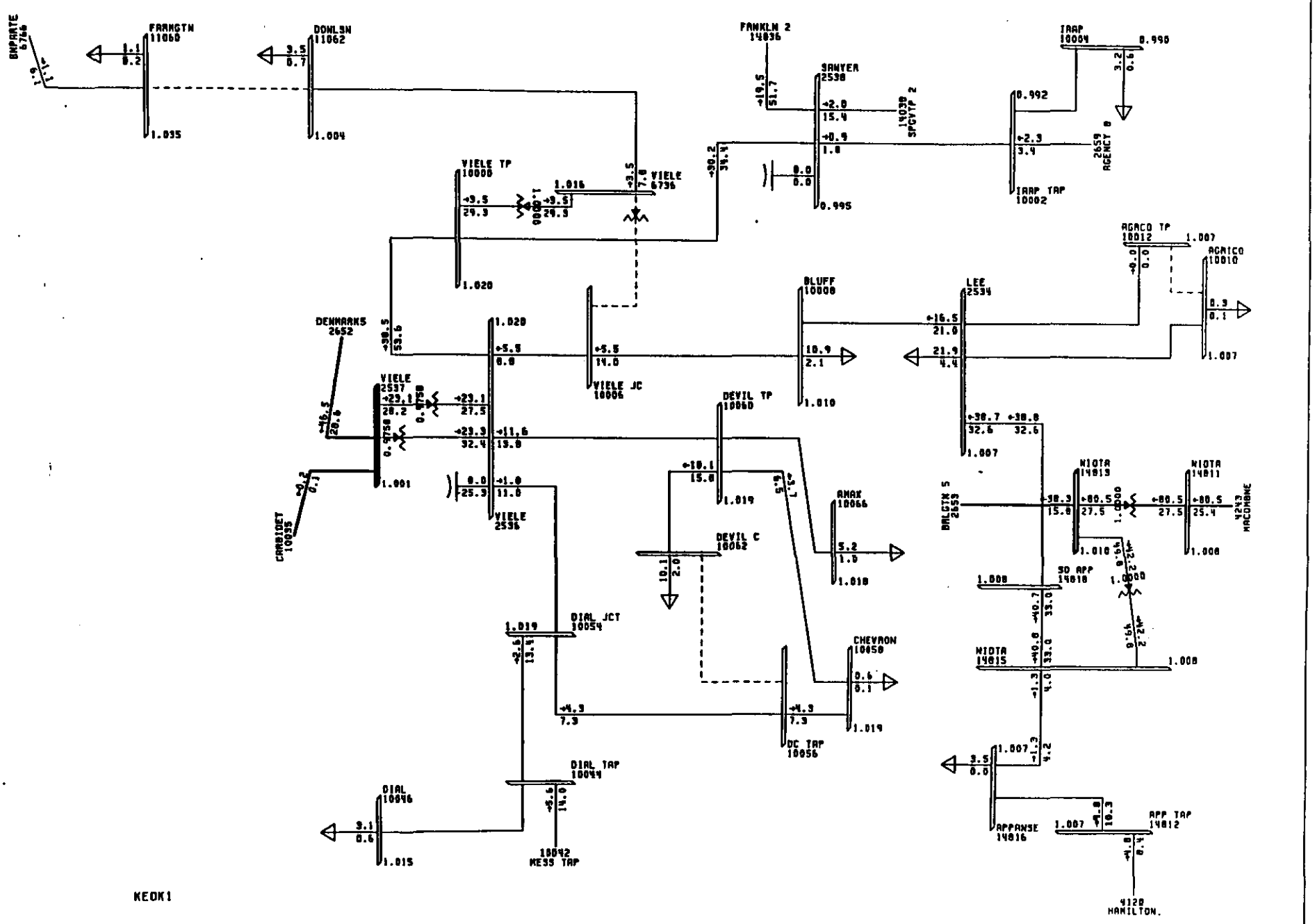
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



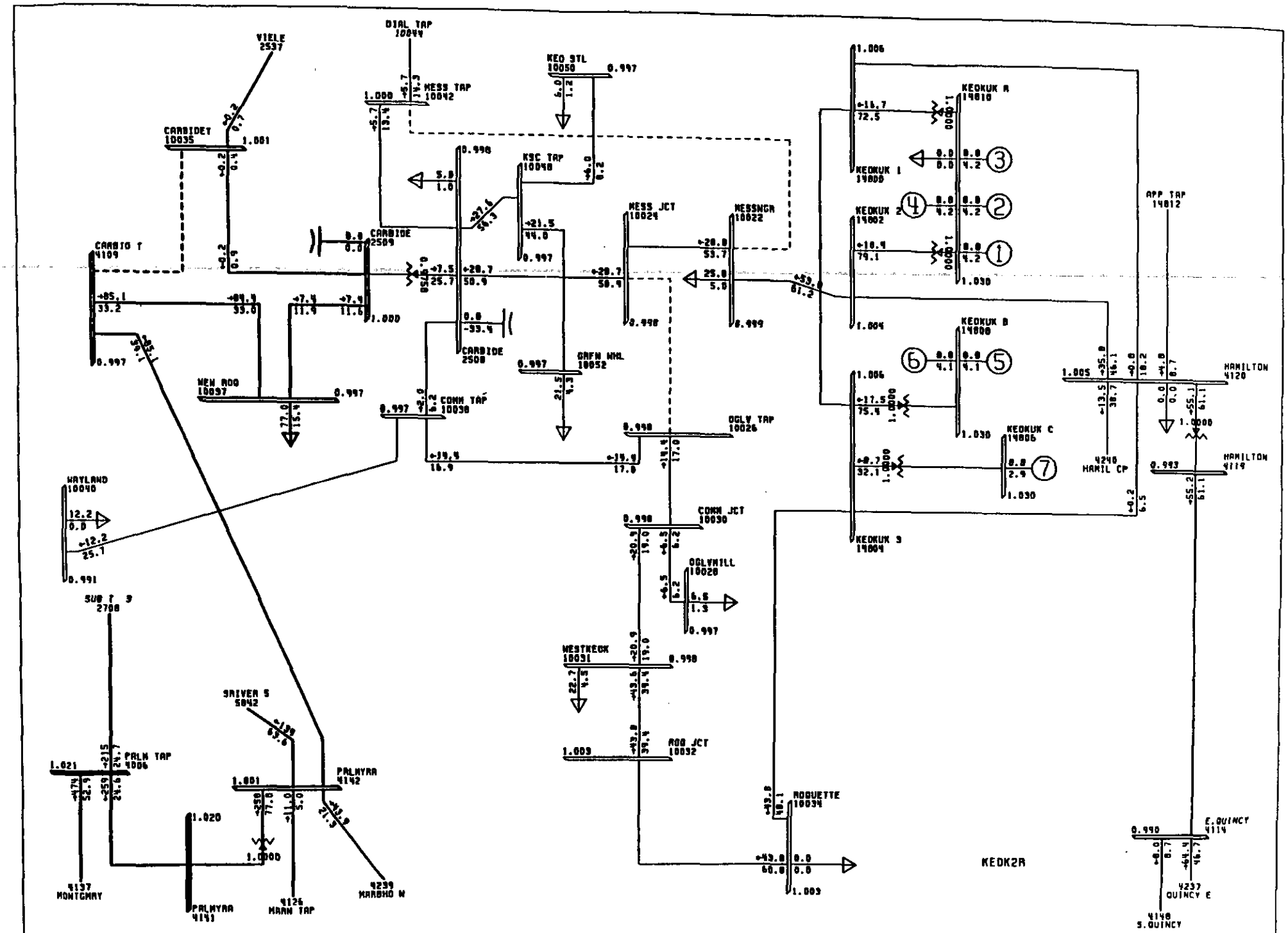
1996C ADDITIONAL 7MW AT ROQUETTE, 16MW FERROSIL AT WEST KEO
CONT 3 LOSS OF CARBIDE XFMR

100% RATED
0.925 UV 1.060 OV

BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A



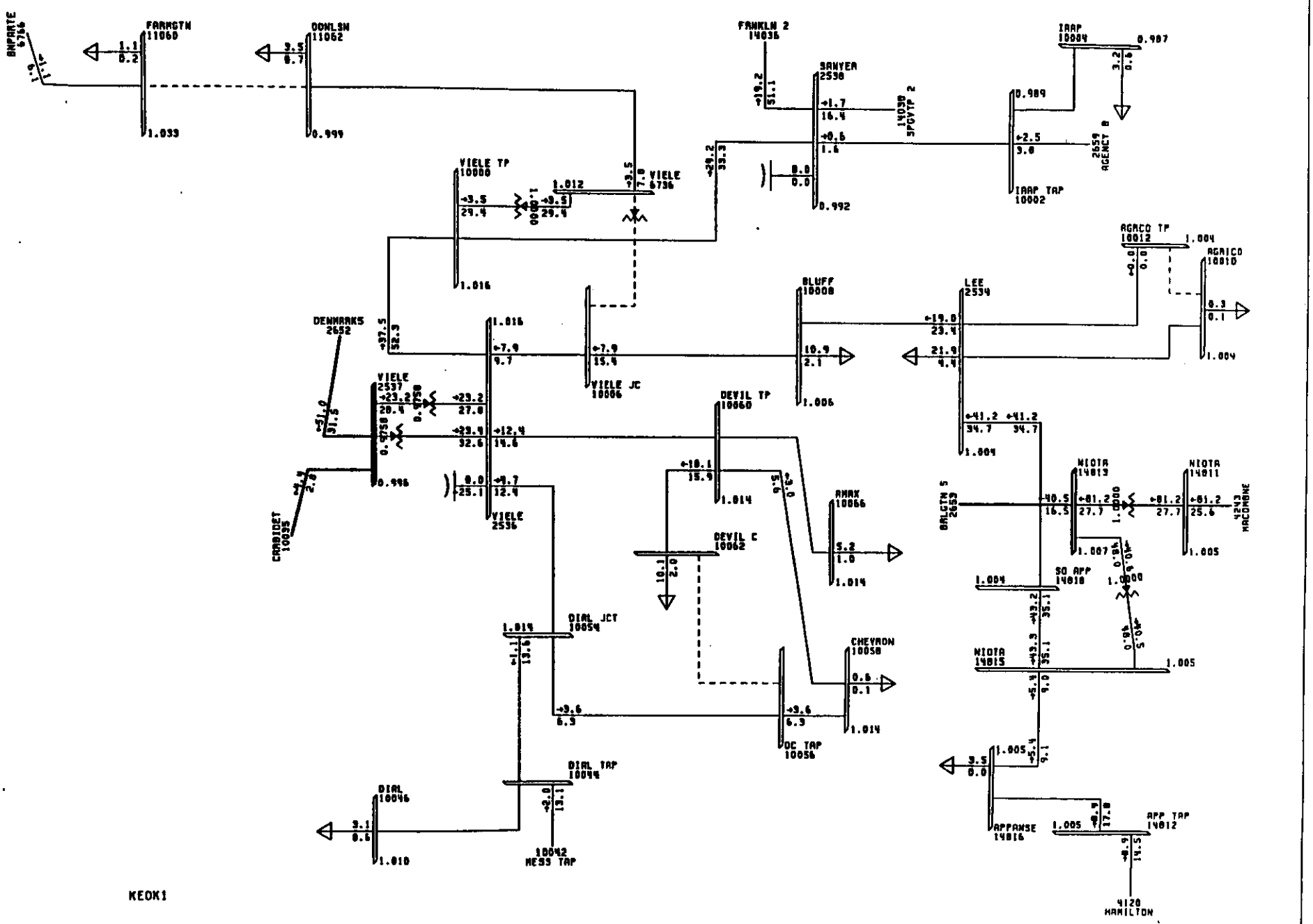
POWER TECHNOLOGIES	1998B 161KV PLAN BASE CASE FRI, JUN 02 1995 15:45	100% RATEA 0.925 UV 1.060 OV KV: ≤72 , ≤141 , ≤167	BUS - VOLTAGE (PU) BRANCH - MW/% OF RATE A EQUIPMENT - MW/MVAR



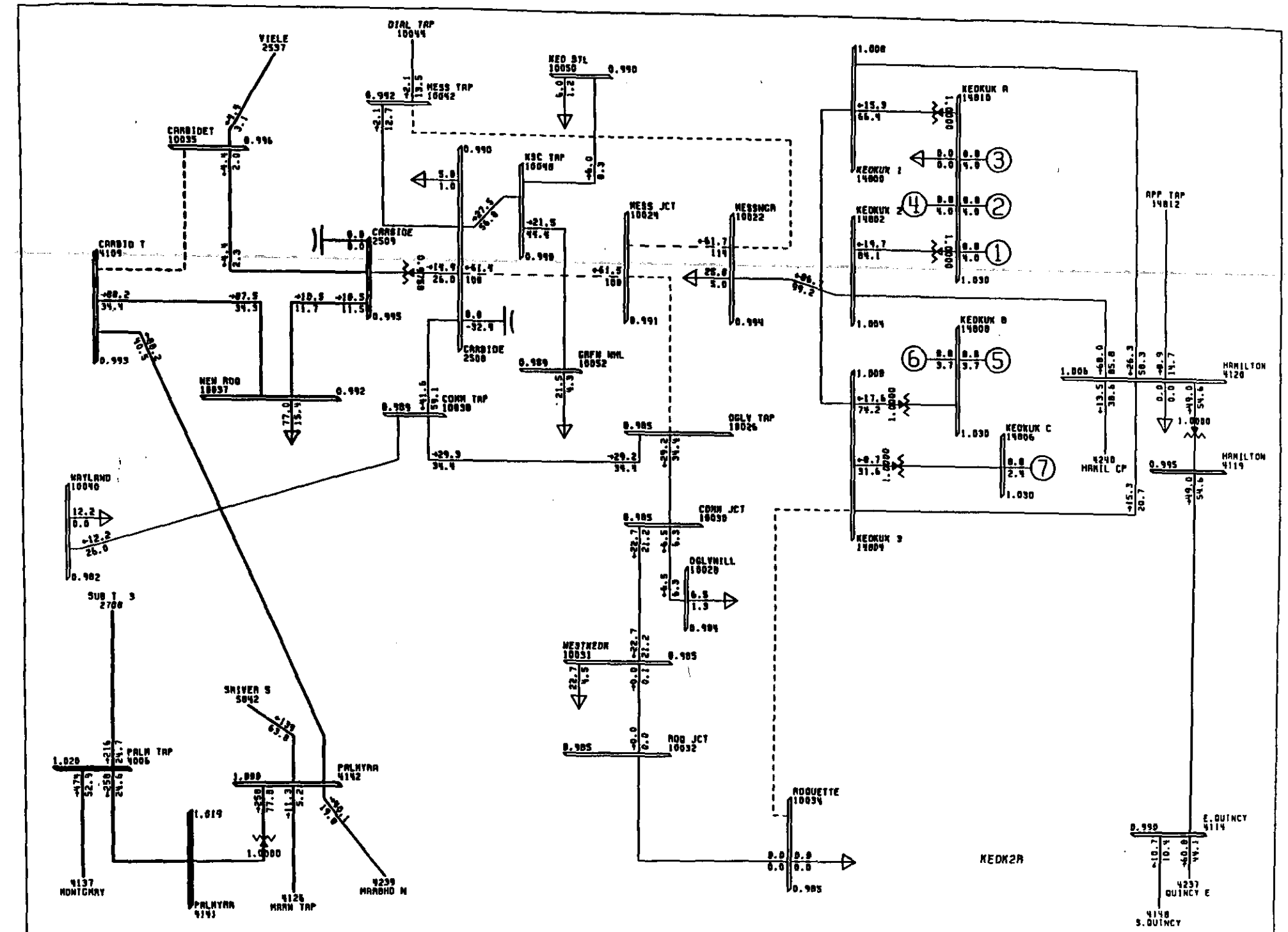
1998B 161KV PLAN
BASE CASE

100% RATED
0.925 UV 1.060 OV

BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A



POWER TECHNOLOGIES, INC.	1998B 161KV PLAN CONT 1: LOSS OF NEW HYDRO-ROQUETTE LINE FRI, JUN 02 1995 15:45	100% RATE B 0.925 UV 1.060 OV KV: ≤72 , ≤141 , ≤167	BUS - VOLTAGE (PU) BRANCH - MW/% OF RATE A EQUIPMENT - MW/MVAR



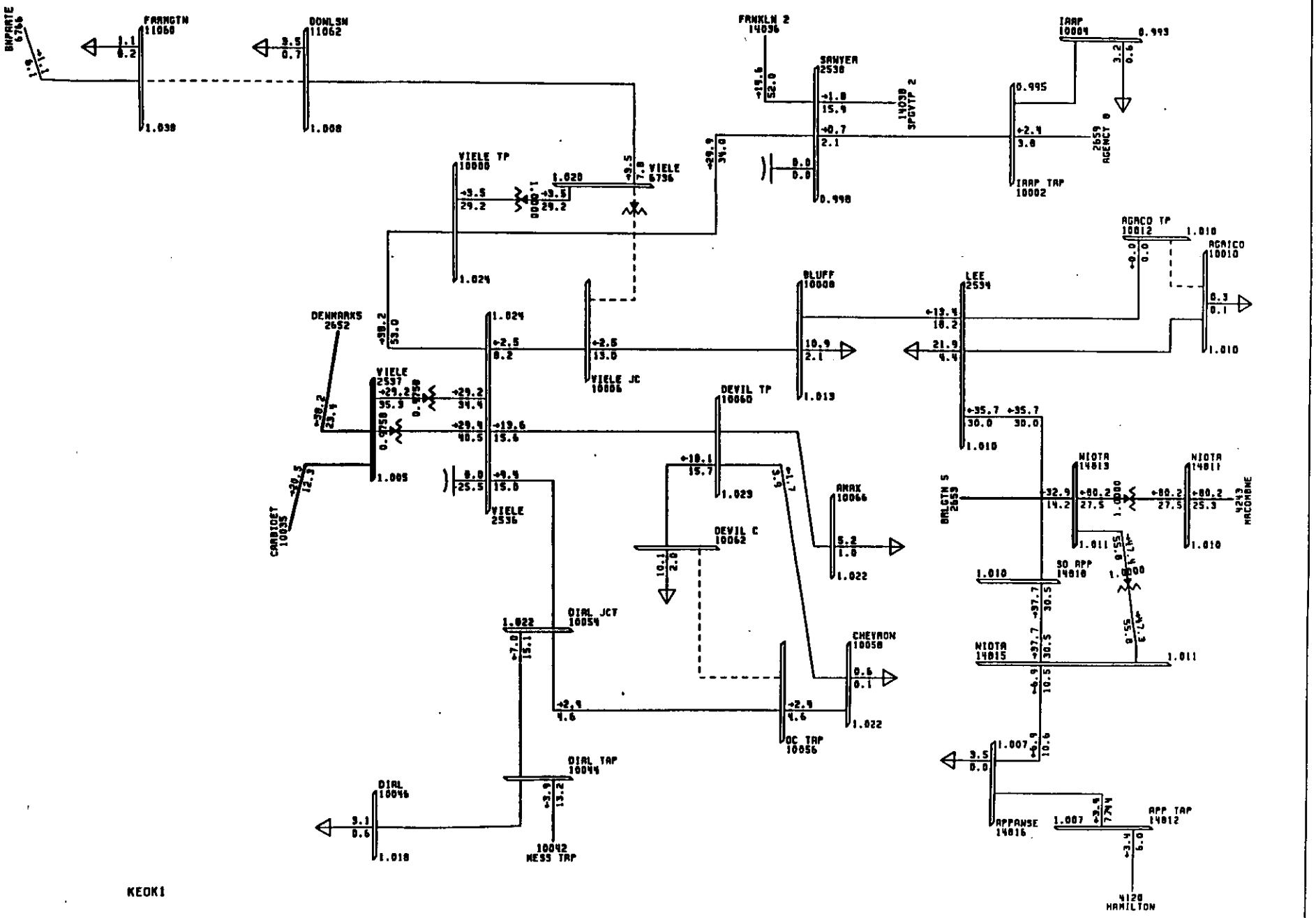
1998B 161KV PLAN

100% RATEA

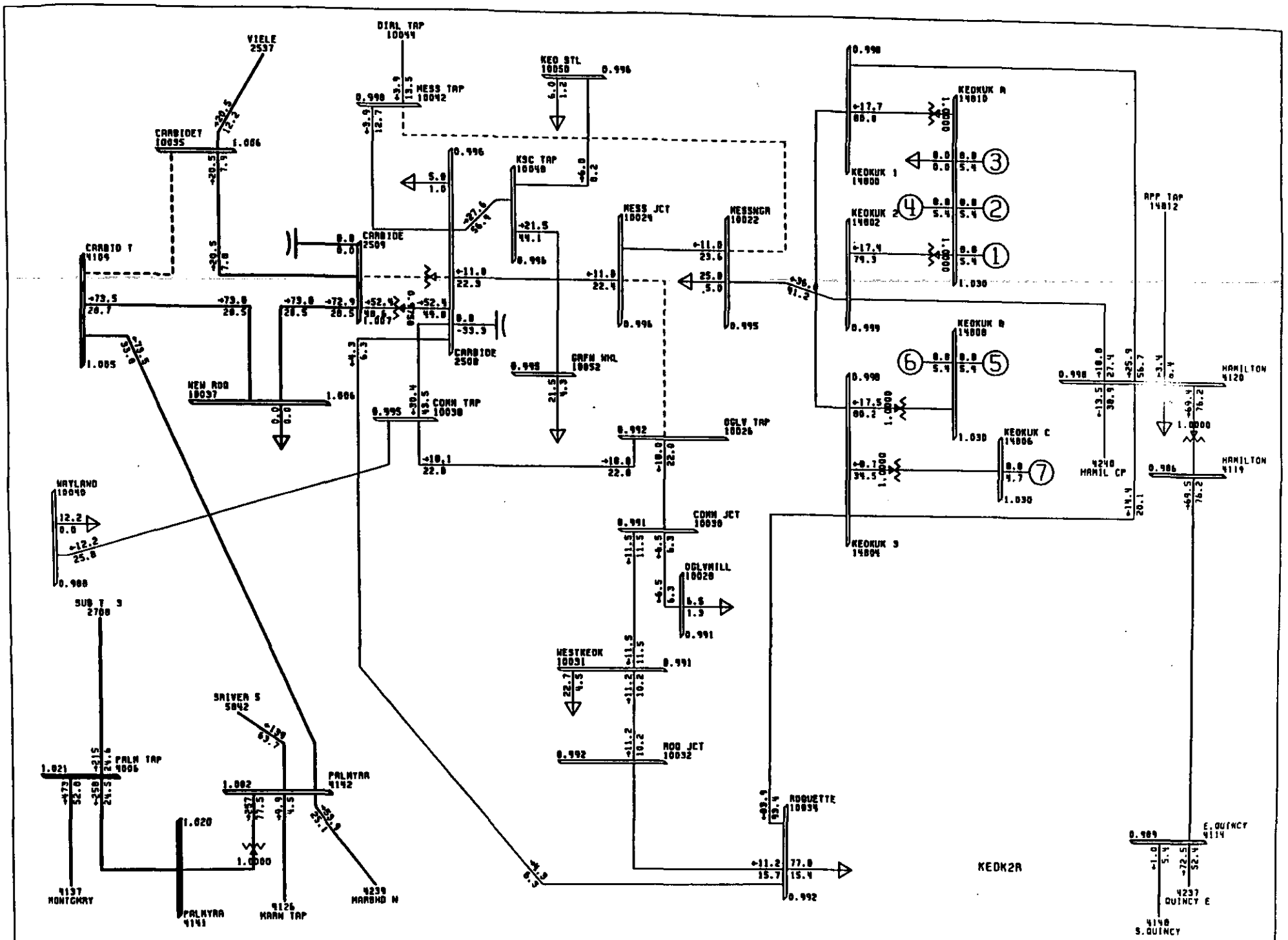
0.925UV 1.060OV

BUS - VOLTAGE (PU)

BRANCH - MW/% OF RATE A



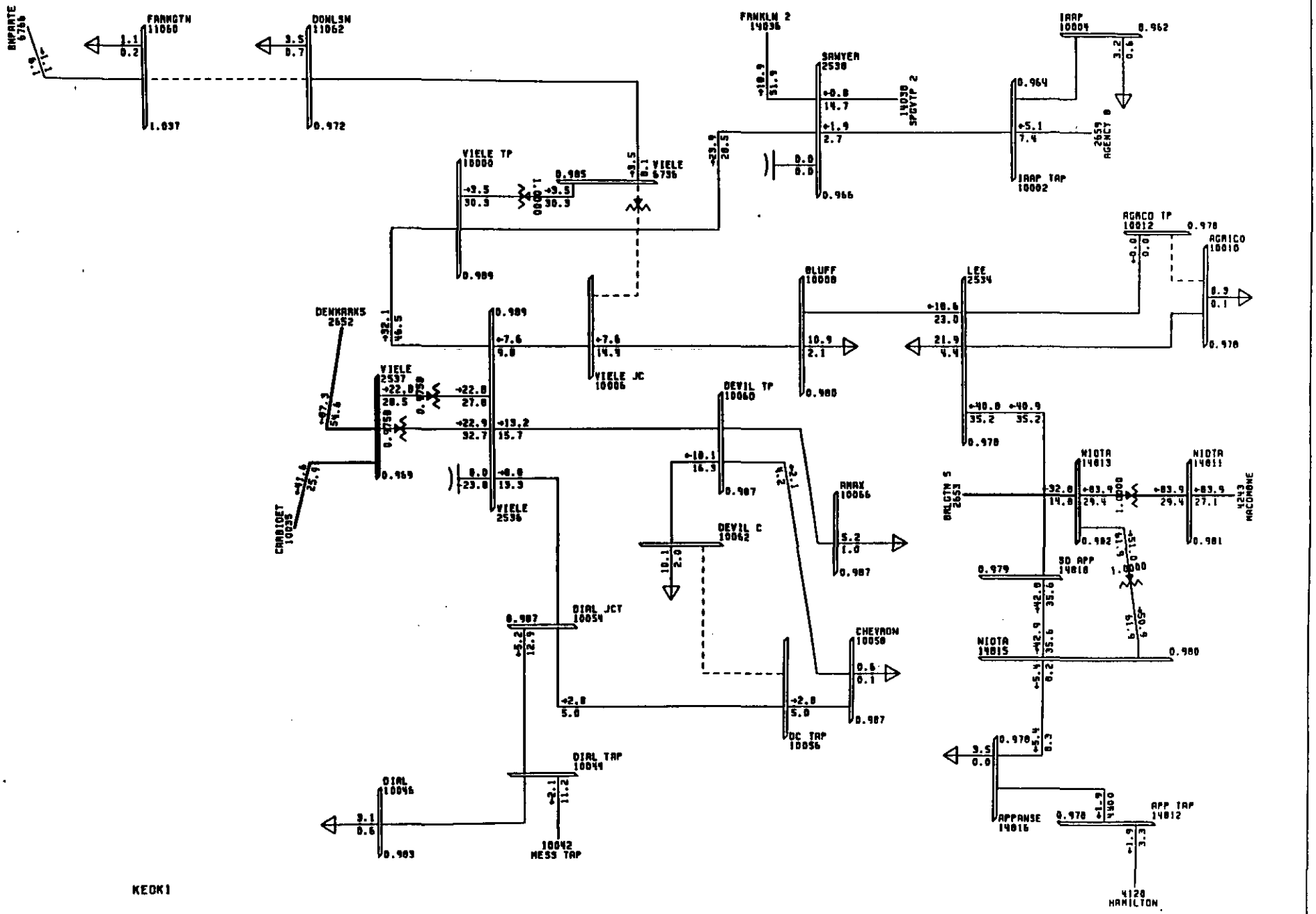
POWER TECHNOLOGIES, INC.	1998B 69KV PLAN CONT 3: LOSS OF CARBIDE XFMR FRI, JUN 02 1995 15:48	100% RATEA 0.925 UV 1.060 OV KV: ≤72 , ≤141 , ≤167	BUS - VOLTAGE (PU) BRANCH - MW/% OF RATE A EQUIPMENT - MW/MVAR



1998B 69KV PLAN
CONT 3: LOSS OF CARBIDE XFMR

100% RATEA
0.925UV 1.060OV

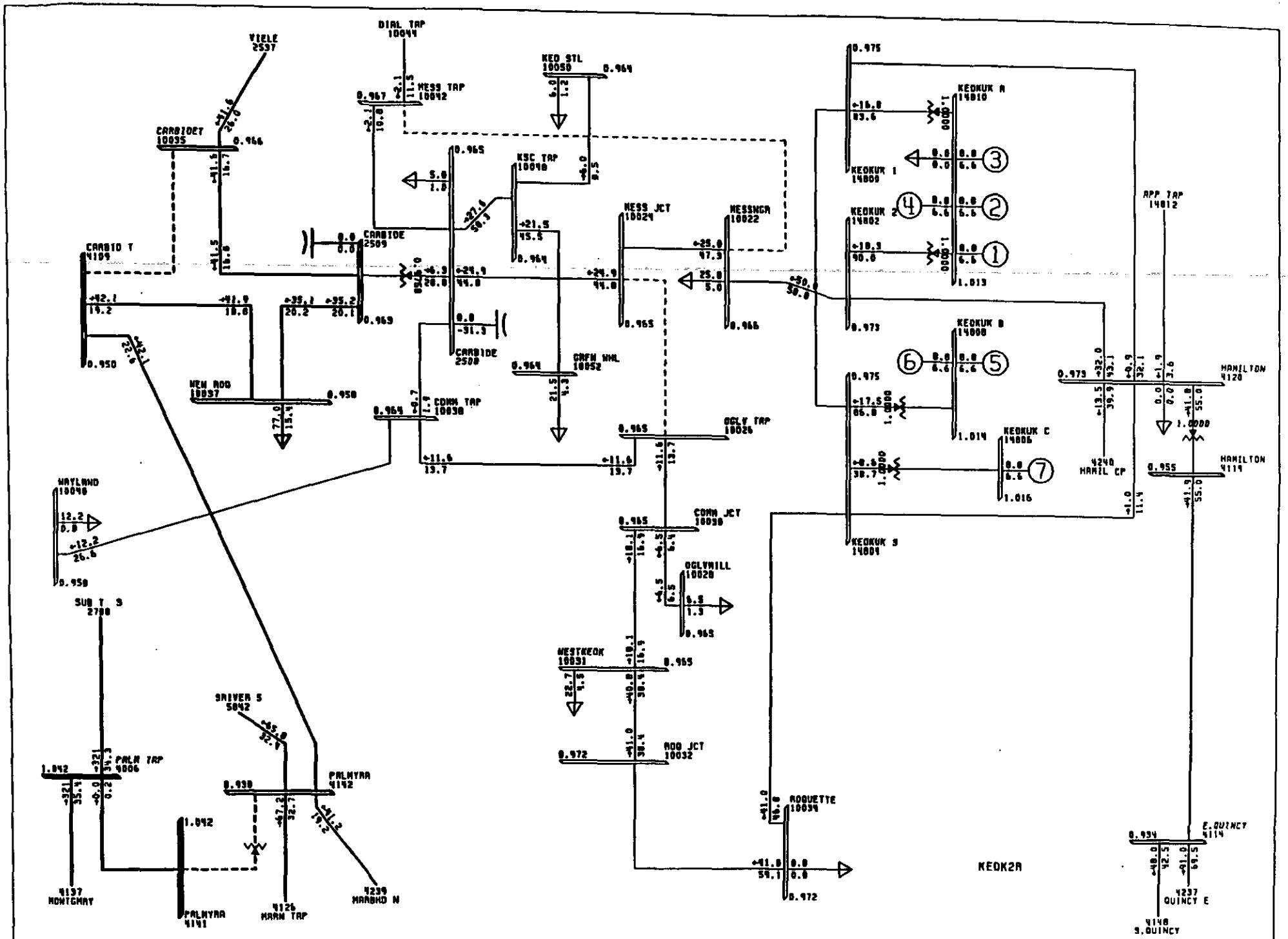
BUS - VOLTAGE(PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



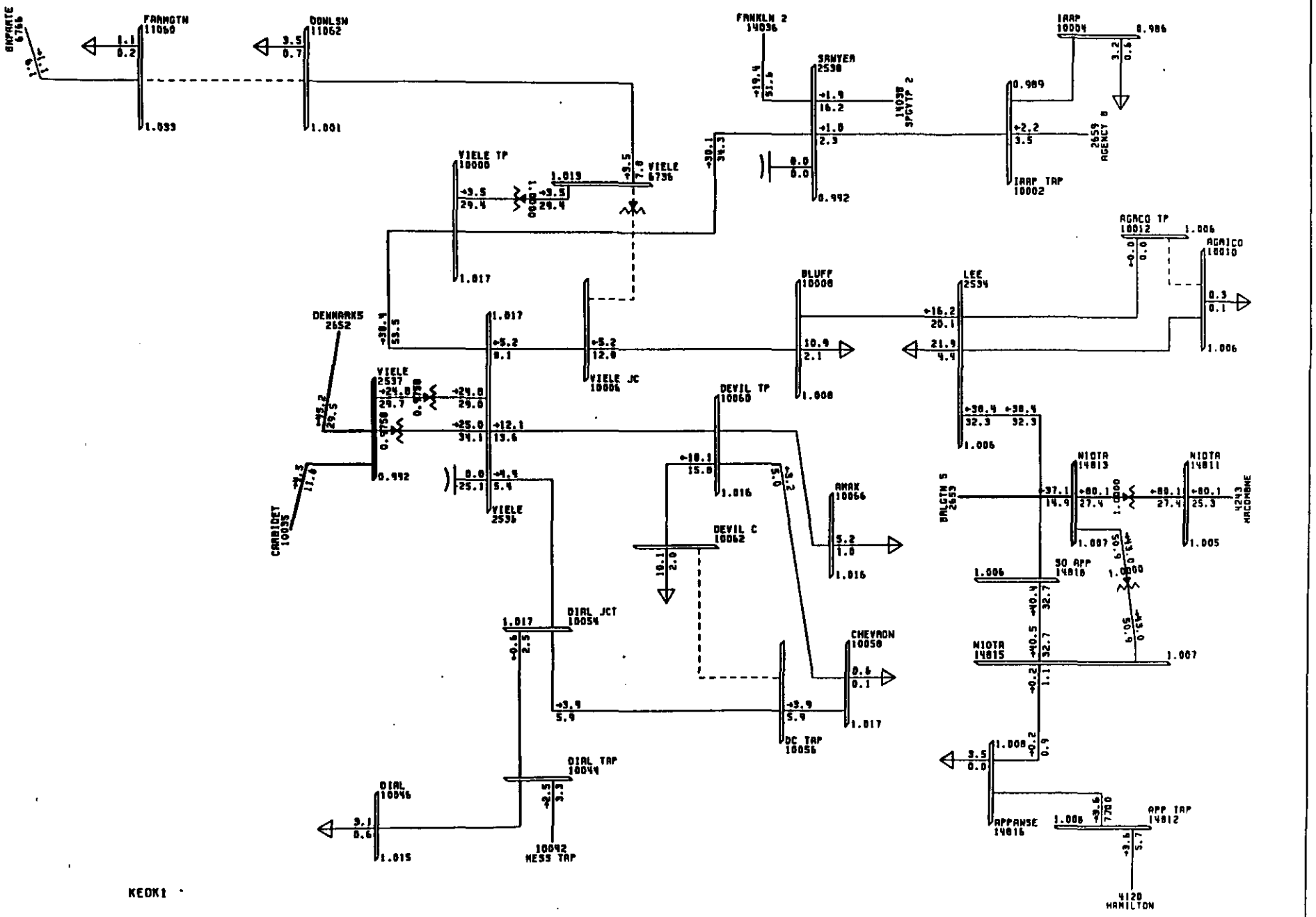
1998B 161KV PLAN
CONT 2: LOSS OF PALMYRA 345/161
EDT .JUN 02 1995 15:45

100% RATEA
0.925 UV 1.060 OV
KV: ≤72 ,≤141 ,≤167

BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



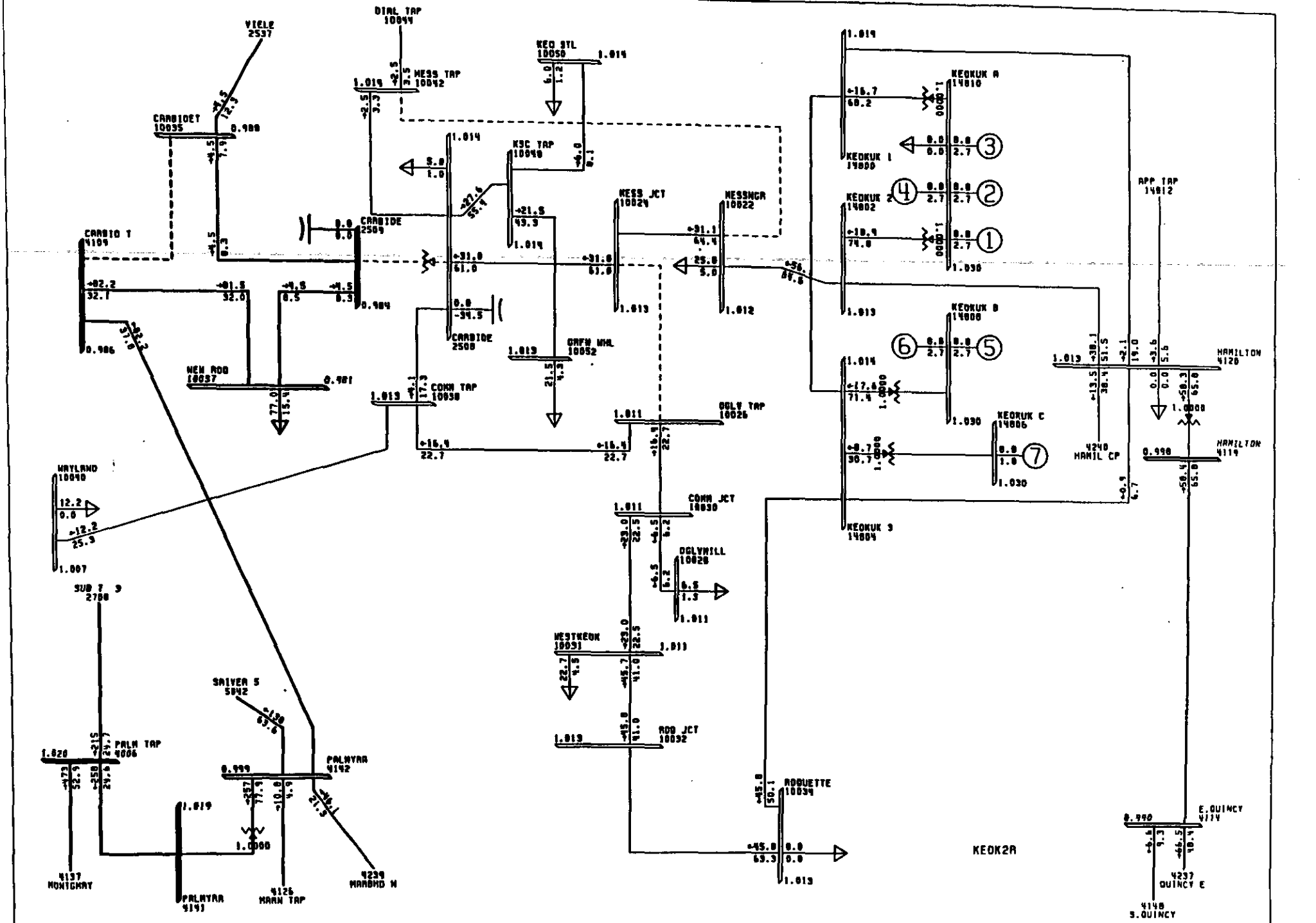
2: LOSS OF PALMYRA 345/161



1998B 161KV PLAN
CONT 3: LOSS OF CARBIDE XFMR

100% RATEA
0.925 UV 1.060 OV
KV: ≤72 , ≤141 , ≤167

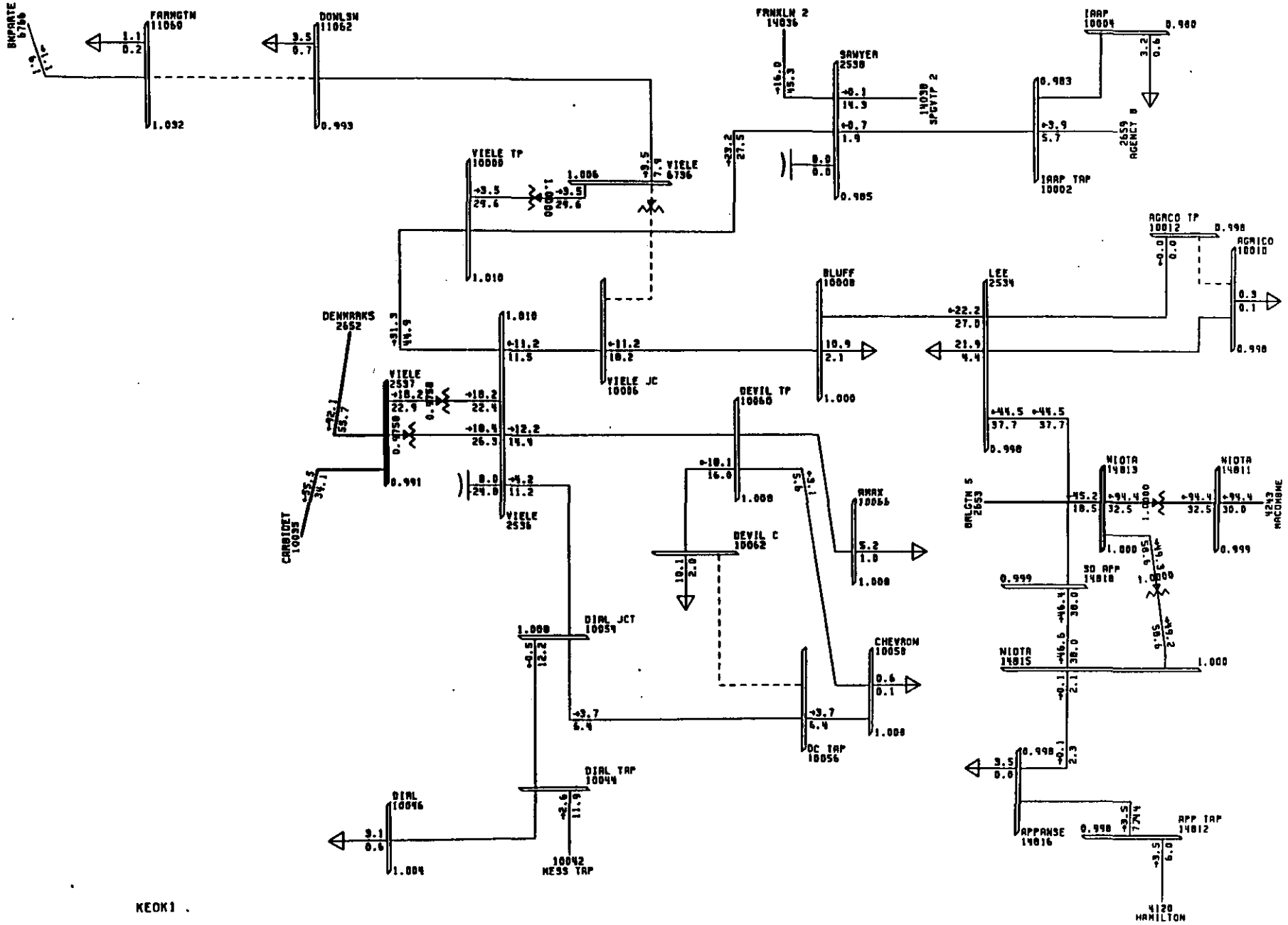
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



1998B 161KV PLAN
CONT 3: LOSS OF CARBIDE XFMR

100% RATEA
0.925 UV 1.060 OV

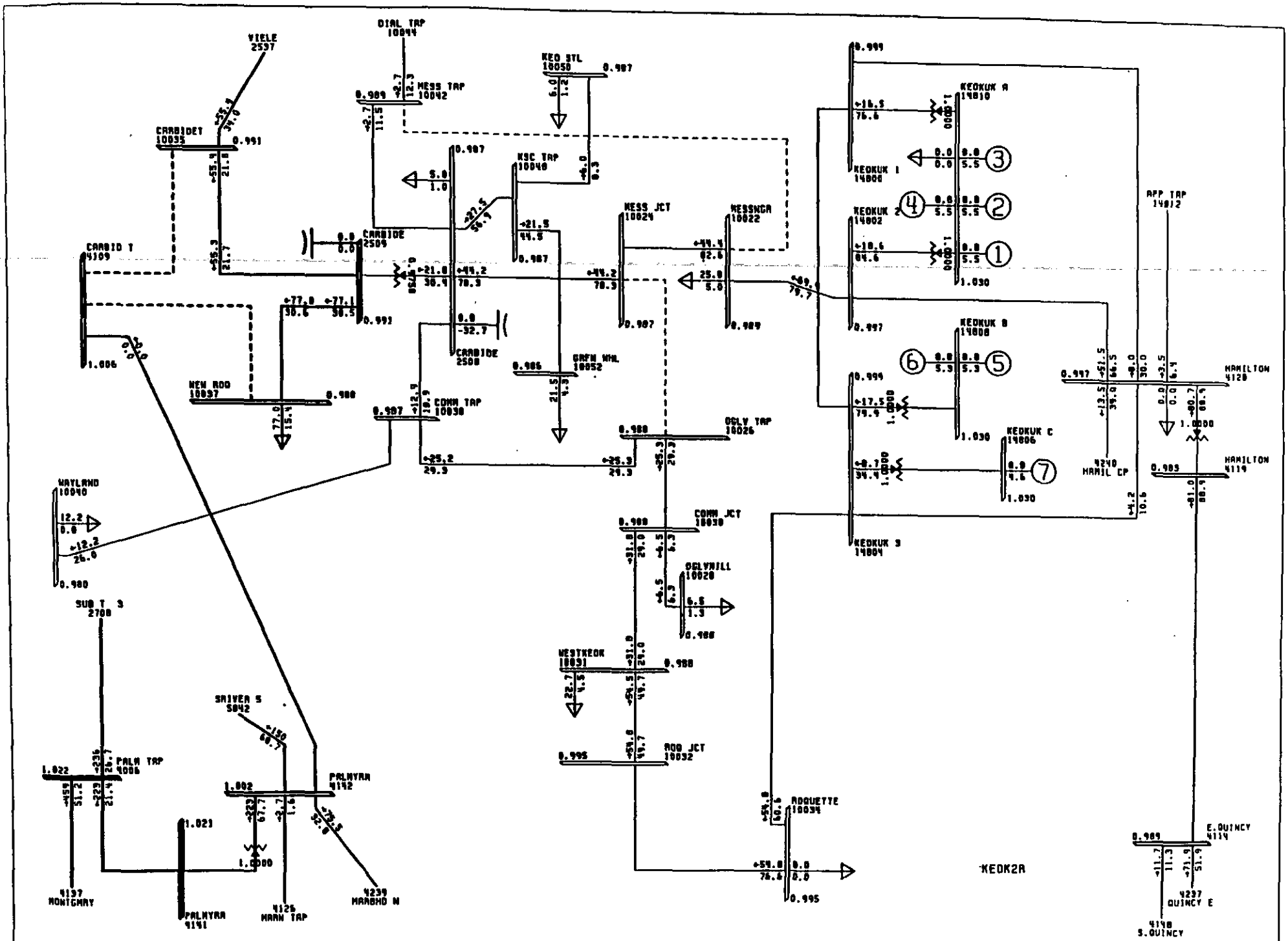
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A

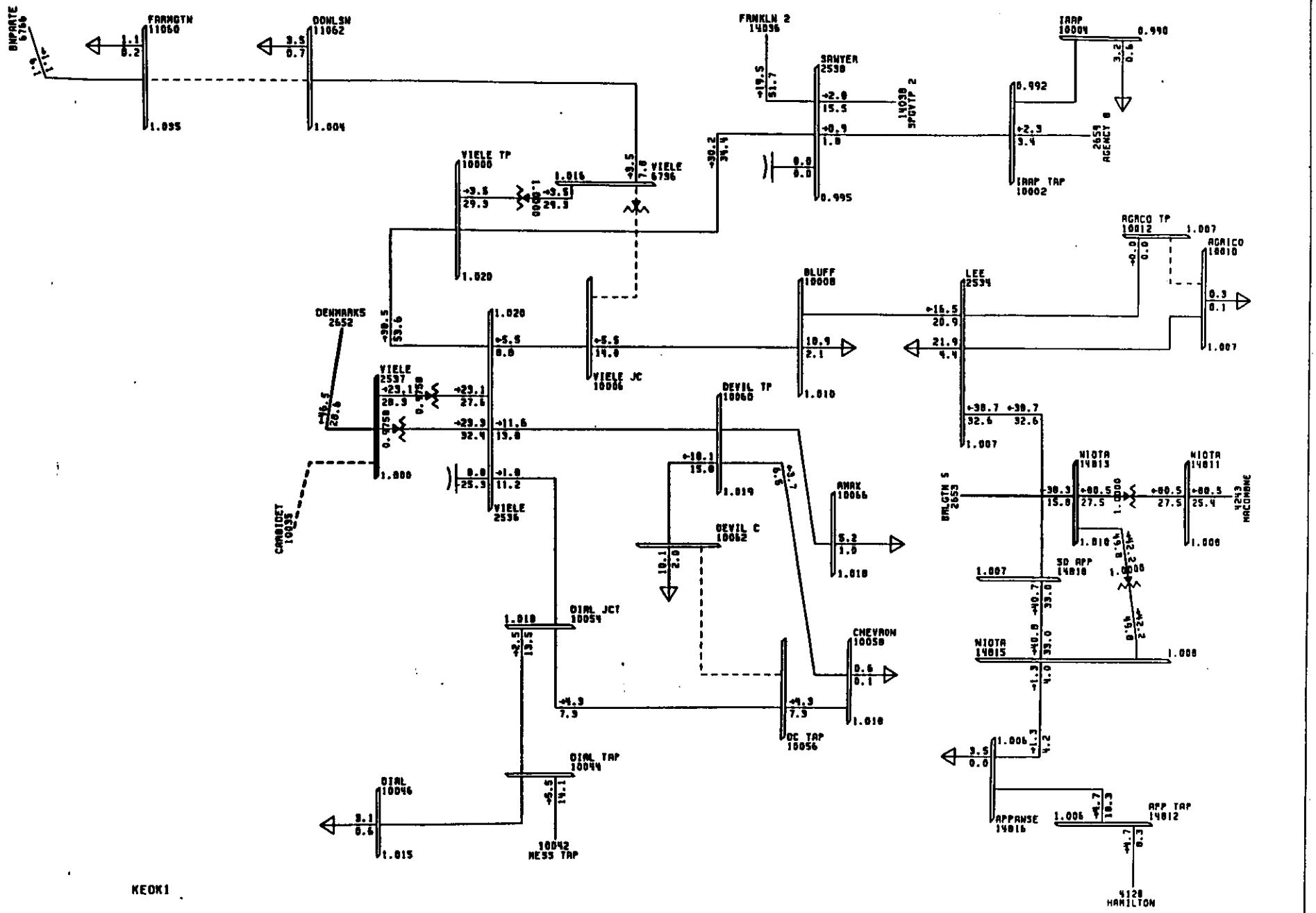


1998B 161KV PLAN
CONT 4: LOSS OF CARBIDE T - NEW ROQUETTE

100% RATEA
0.925 UV 1.060 OV
KV: ≤72 ,≤141 ,≤167

BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR

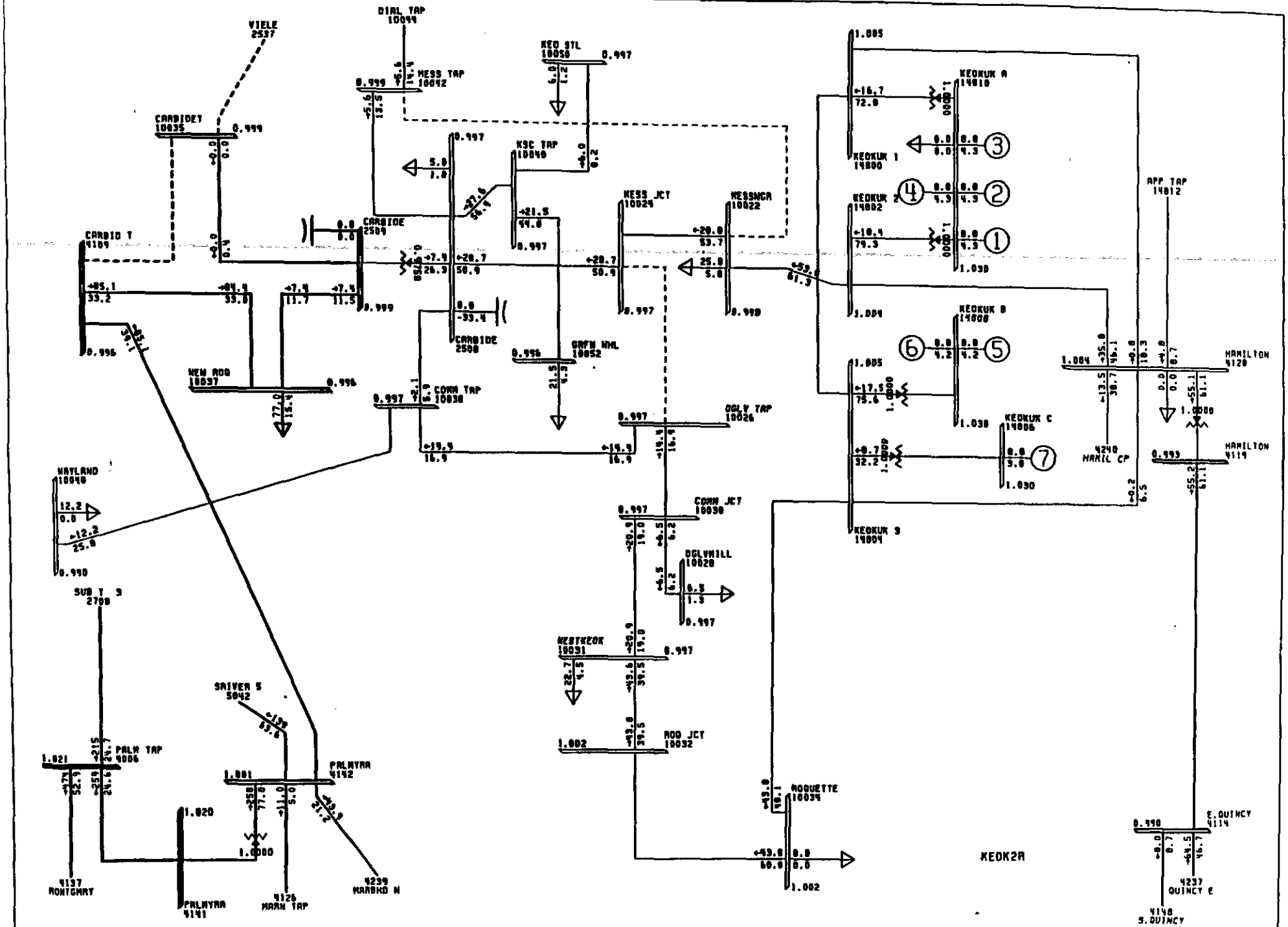

1998B 161KV PLAN
100% RATEA
0.925UV 1.060OV
KV
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
KEOK2R
VIELE 2597
DIAL TAP 10044
MESS TAP 10042
KEO STL 10050
CARBIDET 10035
KSC TAP 10040
CARBID T 4109
CARBIDE 2509
MESS JCT 10024
MESSNGR 10022
CARBIDE 2508
KEOKUK A 14810
KEOKUK 1 14800
KEOKUK 2 14802
KEOKUK B 14808
KEOKUK C 14806
KEOKUK 3 14804
APP TAP 14812
HAMILTON 4120
HAMILTON 4119
HAMIL CP 4240
NEW ROD 10037
GRFN WHL 10052
CONN TAP 10030
OGLV TAP 10026
CONN JCT 10030
OGLYHILL 10020
WESTKEOK 10031
ROD JCT 10032
WAYLAND 10040
SUB T 3 2708
SRIVER S 5042
PALM TAP 4006
PALMYRA 4112
MONTGMRY 4197
PALMYRA 4141
MARN TAP 4126
MARSHD N 4239
ROQUETTE 10034
E.QUINCY 4114
QUINCY E 4237
S.QUINCY 4198



1998B 161KV PLAN
CONT 5: LOSS OF CARBIDE - VIELE
FRI. JUN 02 1995 15:46

100% RATEA
0.925UV 1.060 OV
KV: ≤72 , ≤141 , ≤167

BUS - VOLTAGE(PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



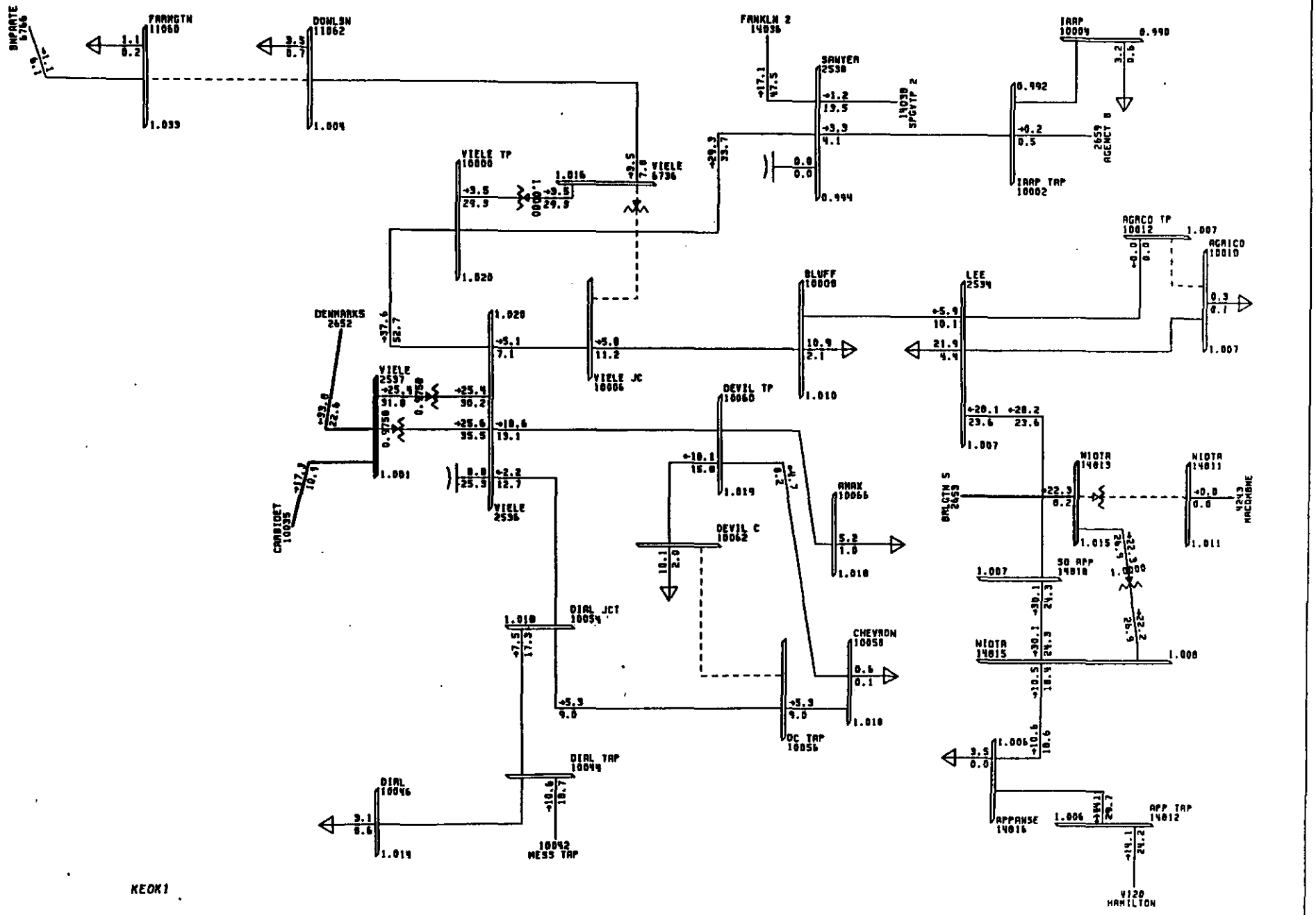
1998B 161KV PLAN

100% RATEA

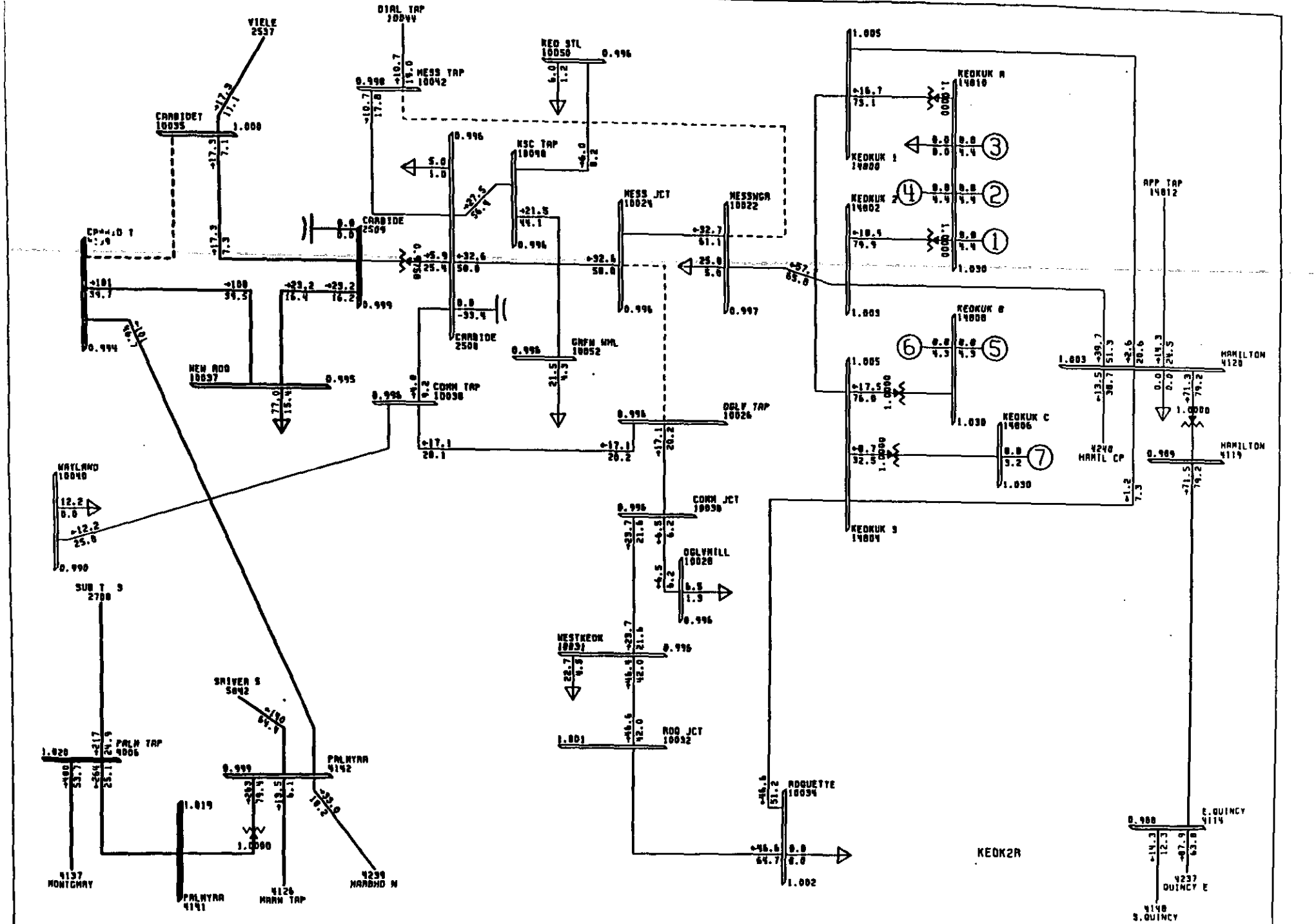
0.925UV 1.060OV

BUS - VOLTAGE(PU)

BRANCH - MW/% OF RATE



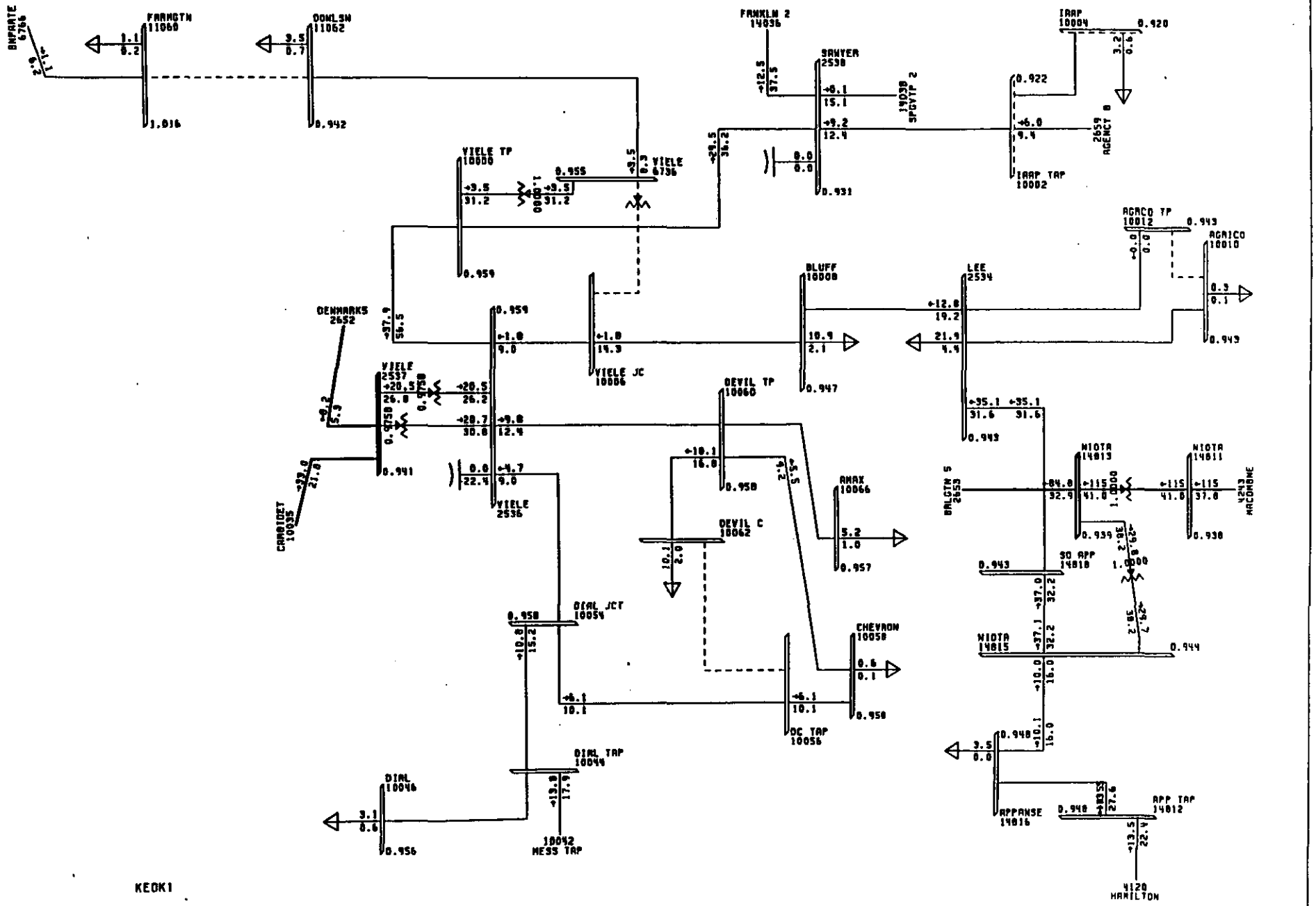
1998B 161KV PLAN CONT 6: LOSS OF NIOTA XFMR	100% RATE A 0.925 UV 1.060 OV KV; ≤72 , ≤141 , ≤167	BUS - VOLTAGE (PU) BRANCH - MW/% OF RATE A EQUIPMENT - MW/MVAR



1998B 161KV PLAN
CONT 6: LOSS OF NIOTA XFMR

100% RATEA
0.925 UV 1.060 OV
KV: 138 141 167

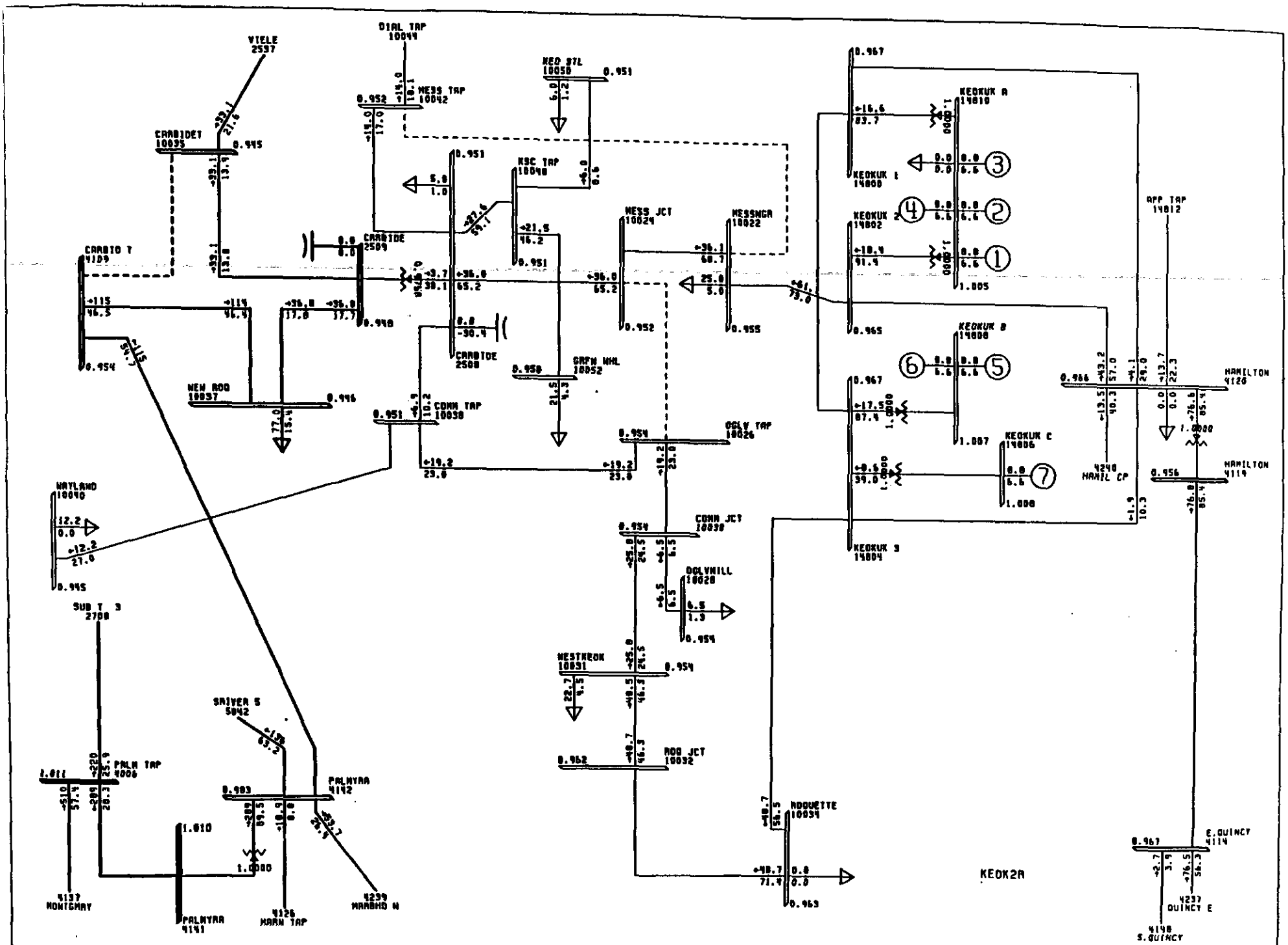
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



1998B 161KV PLAN
CONT 7: BGS OUTAGE

100% RATE A
0.925 UV 1.060 OV

BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



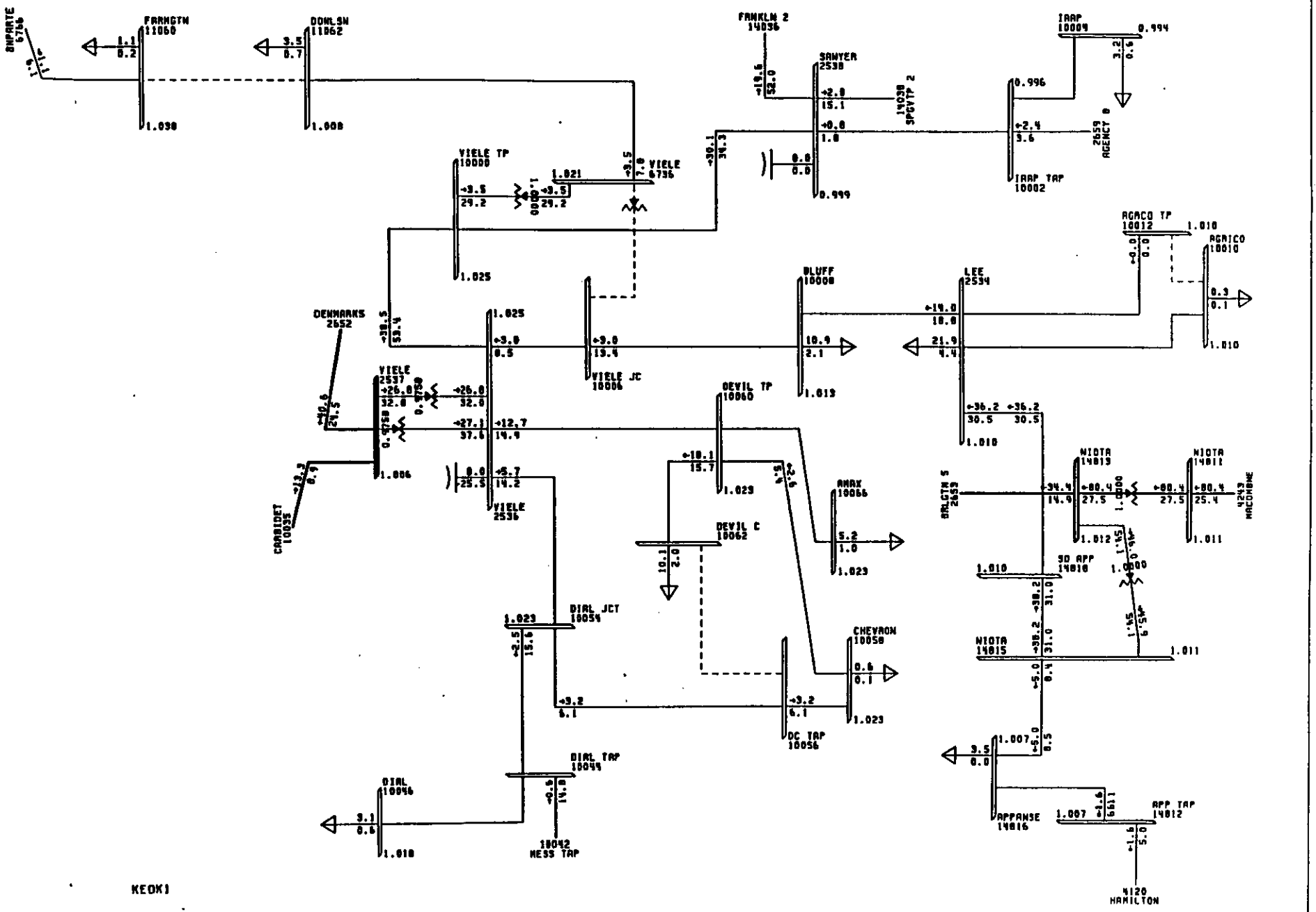
1998B 161KV PLAN

100% RATER

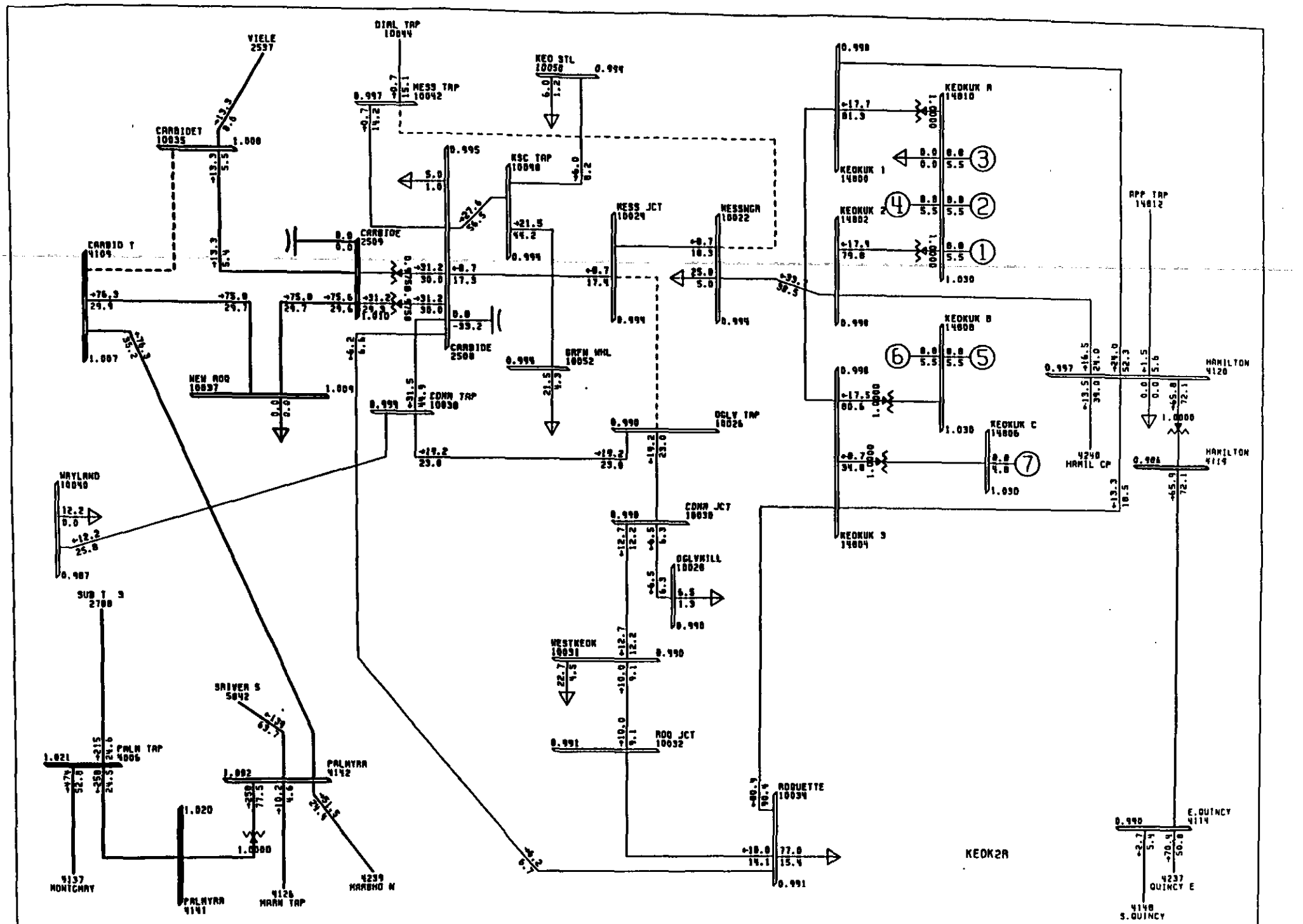
0.925UV 1.060OV

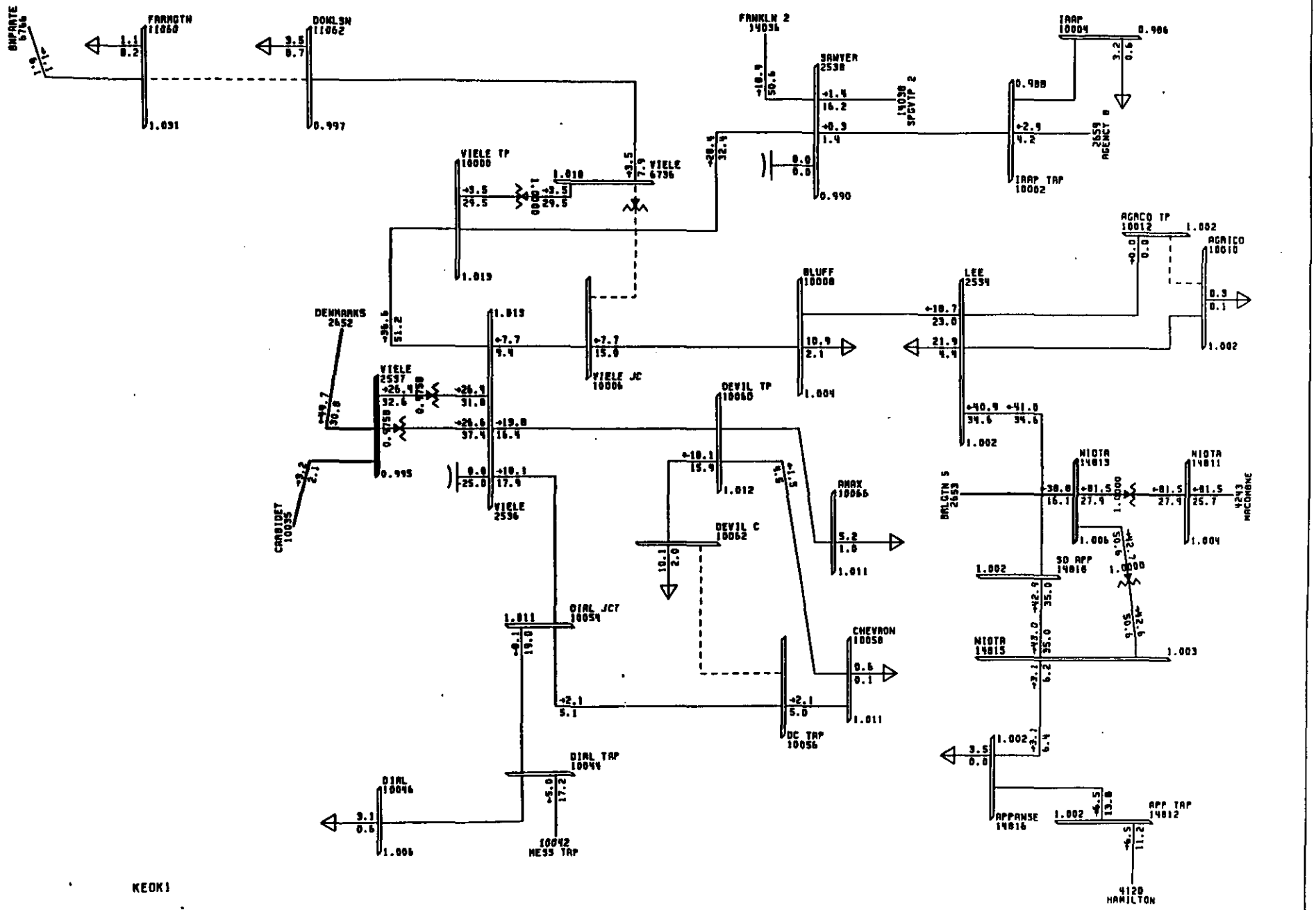
BUS - VOLTAGE (PU)

BRANCH - MW/% OF RATE A



1998B 69KV PLAN BASE CASE FRI, JUN 02 1995 15:48	100% RATER 0.925UV 1.060OV KV: ≤72 , ≤141 , ≤167	BUS - VOLTAGE (PU) BRANCH - MW/% OF RATE A EQUIPMENT - MW/MVAR

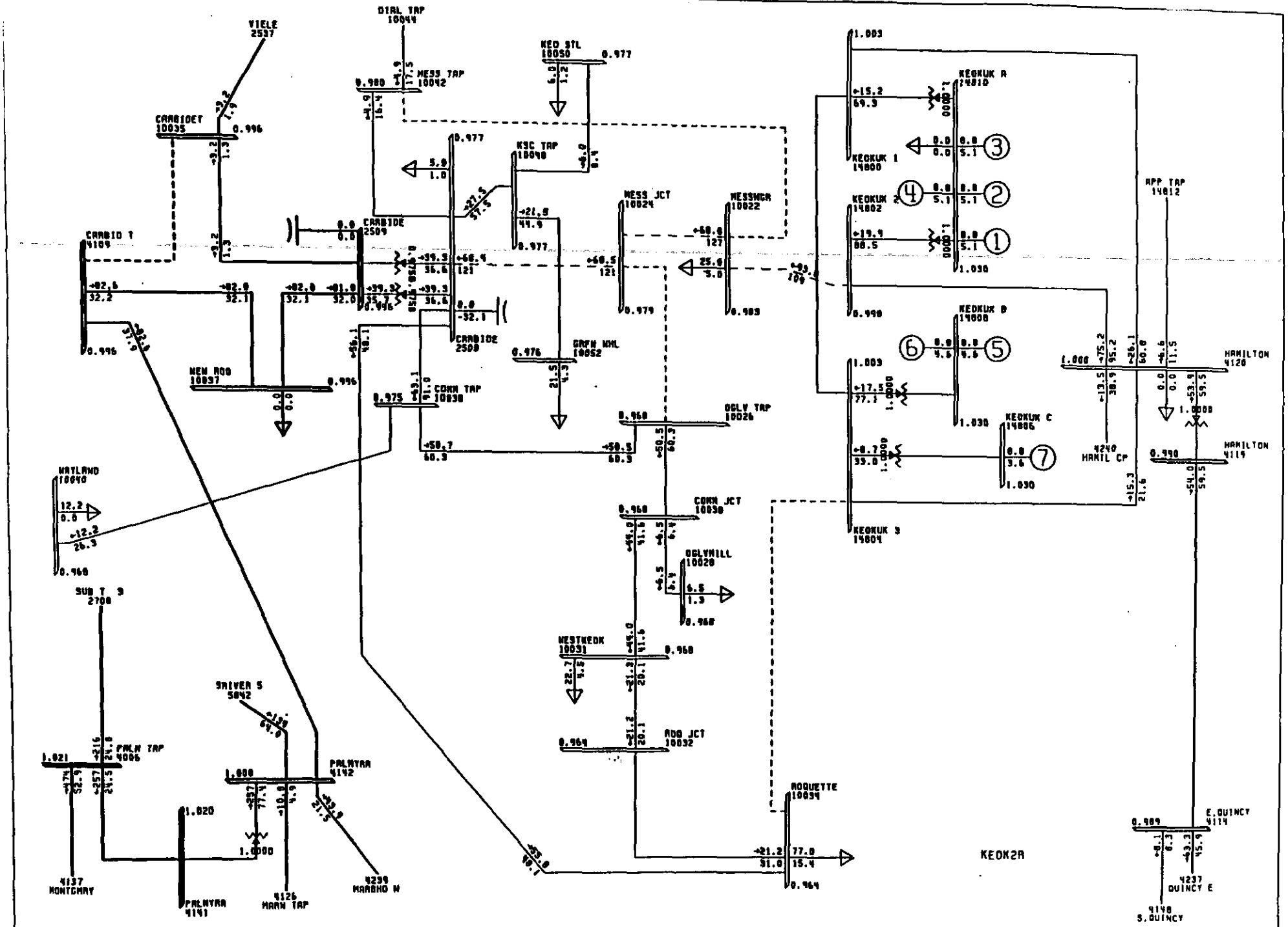

VIELE 2597
DIAL TAP 10044
KEO STL 10050
MESS TAP 10042
CARBIDET 10035
KSC TAP 10048
KESS JCT 10024
MESSNGR 10022
KEOKUK A 14010
KEOKUK 1 14000
KEOKUK 14002
KEOKUK B 14008
KEOKUK C 14006
KEOKUK 9 14004
APP TAP 14012
HAMILTON 4120
HAMILTON 4119
4240 HAMIL CP
CARBID T 4109
CARBIDE 2509
CARBIDE 2500
NEW ROD 10037
EDNA TAP 10038
BRFN WHL 10052
OGLV TAP 10026
EDNA JCT 10030
OGLVHILL 10028
WESTKEOK 10031
ROD JCT 10032
ROQUETTE 10034
WAYLAND 10040
SUB T 9 2708
PALM TAP 4006
PALMYRA 4142
PALMYRA 4141
4137 MONTCHRY
4126 MARN TAP
4239 MARENO N
SRIVER S 5042
E.QUINCY 4114
4237 QUINCY E
4148 S.QUINCY
KEOK2R
1998B 69KV PLAN
100% RATEA
0.925 UV 1.060 OV
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A



1998B 69KV PLAN
CONT 1: LOSS OF NEW HYDRO-ROQUETTE LINE
EDT JUN 02 1995 15:48

100% RATEA
0.925 UV 1.060 OV
KV: ≤72 ,≤141 ,≤167

BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



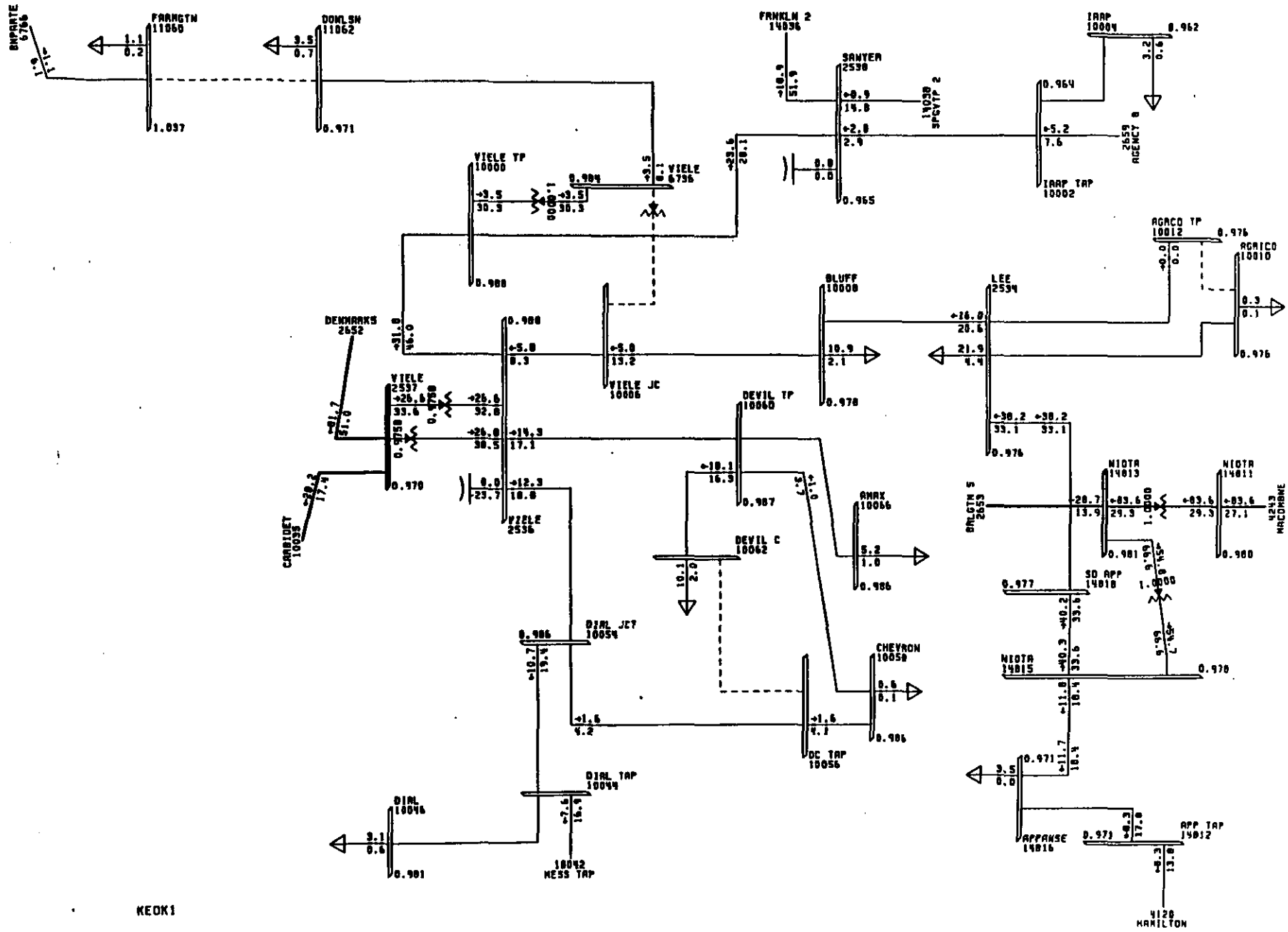
1998B 69KV PLAN

100% RATEA

0.925UV 1.060OV

BUS - VOLTAGE(PU)

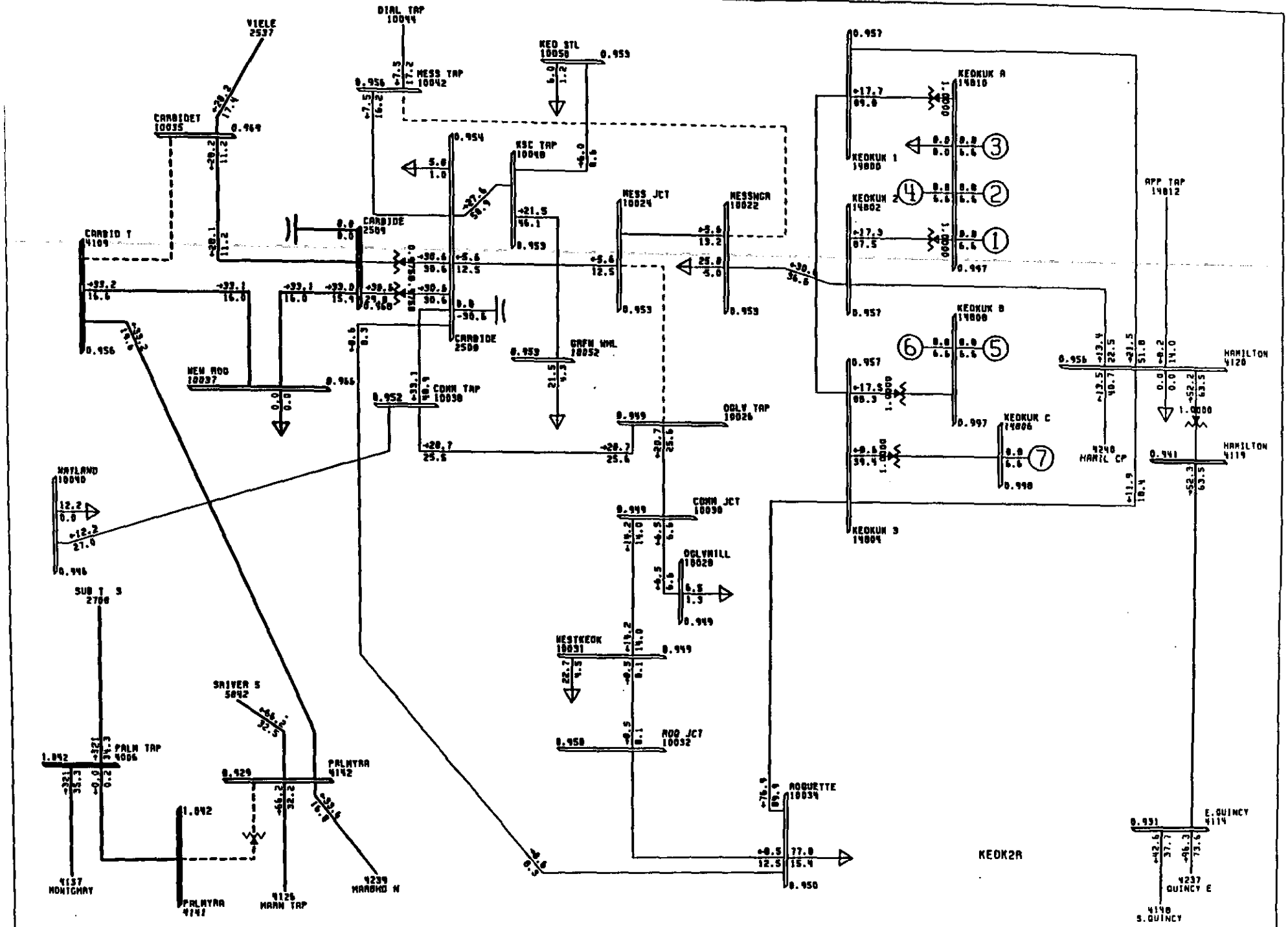
BRANCH - MW/% OF RATE A



1998B 69KV PLAN
CONT 2: LOSS OF PALMYRA 345/161

100% RATED
0.925 UV 1.060 OV
KV: ≤72 , ≤141 , ≤167

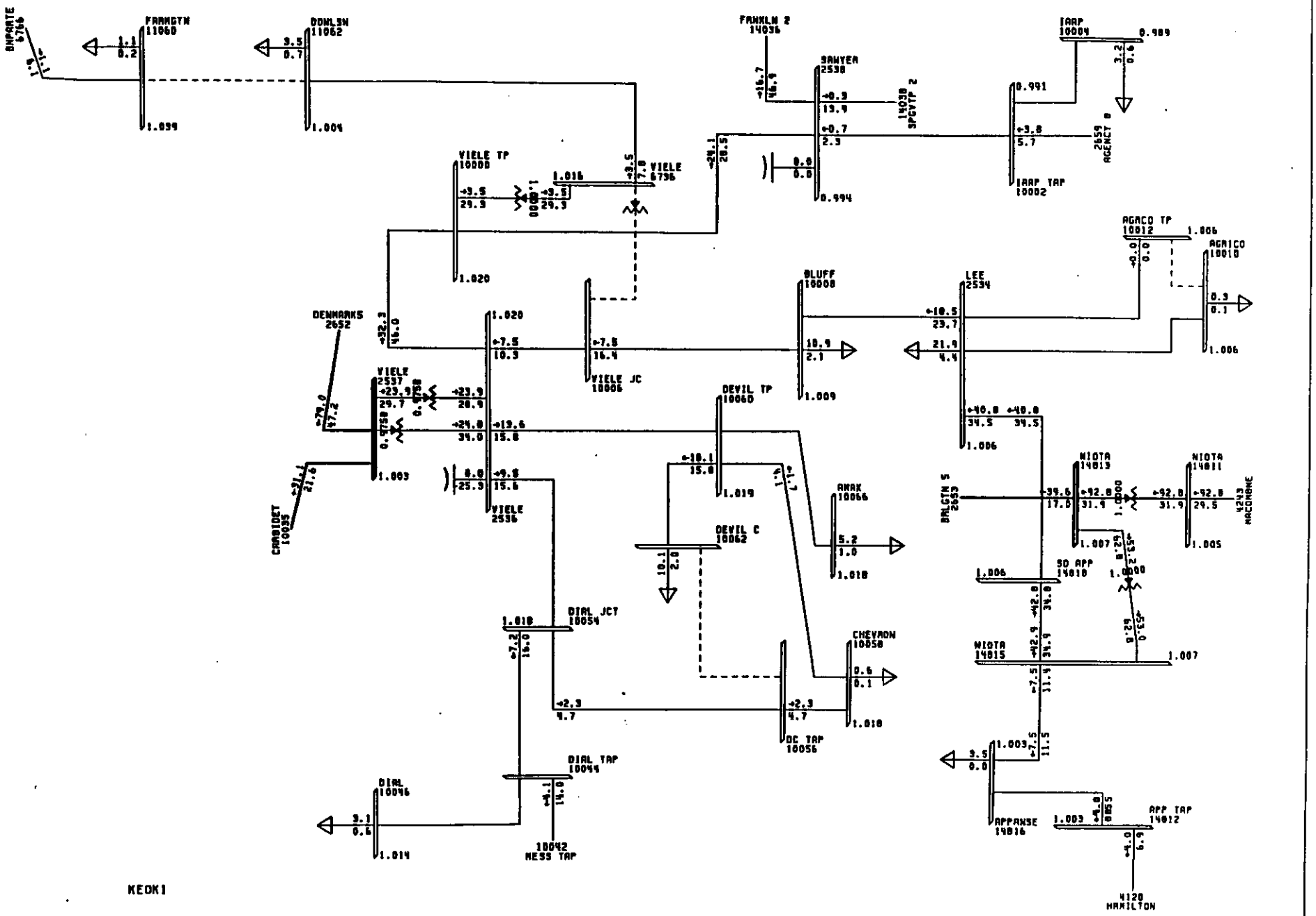
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



1998B 69KV PLAN

100% RATER
0.925UV 1.060OV

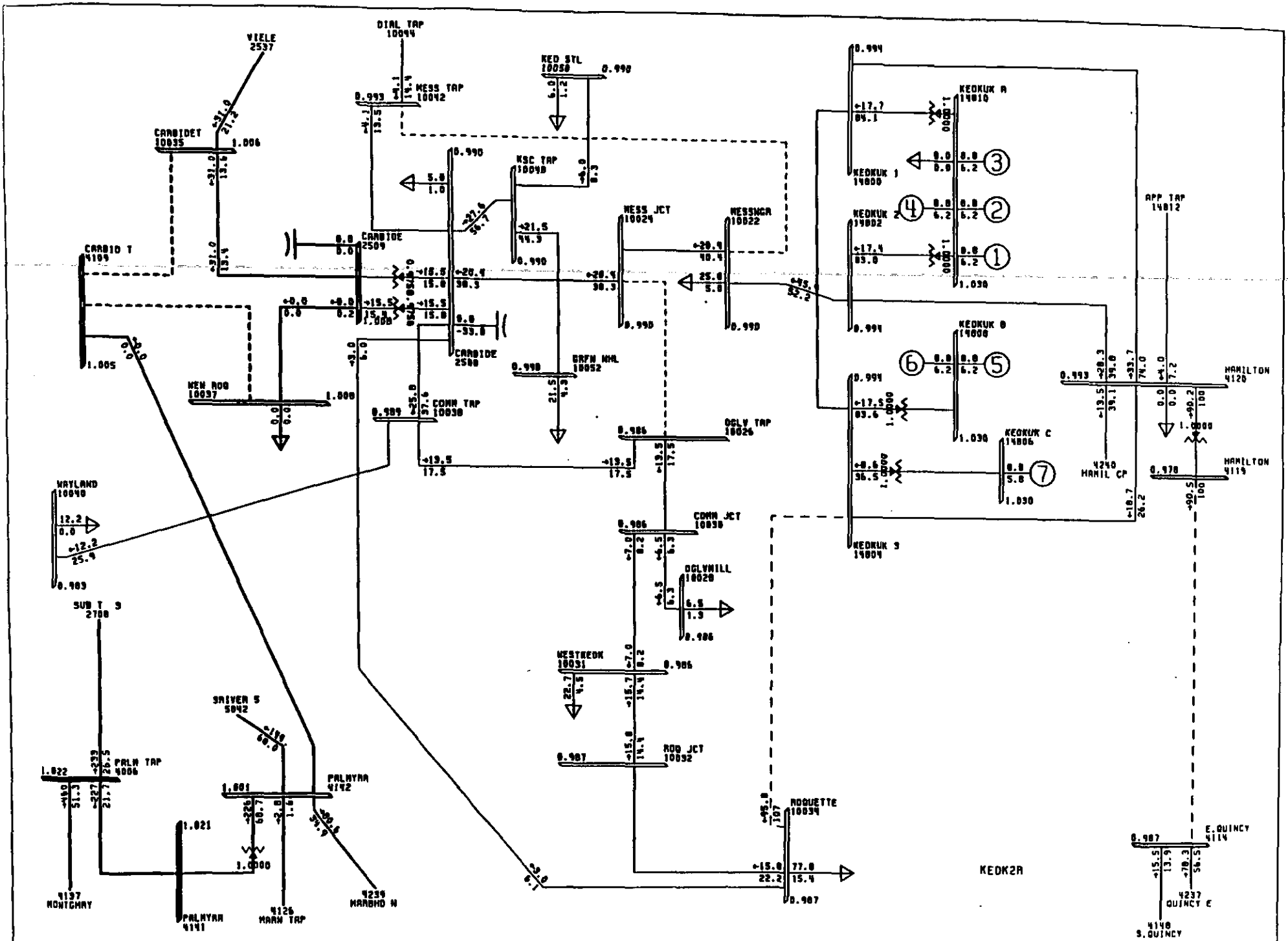
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A



1998B 69KV PLAN
CONT 4: LOSS OF CARBIDE T - NEW ROQUETTE

100% RATEB
0.925 UV 1.060 OV
KV: ≤72 .≤141 .≤167

BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



1998B 69KV PLAN

CONT 4: LOSS OF CARBIDE T - NEW ROQUETTE

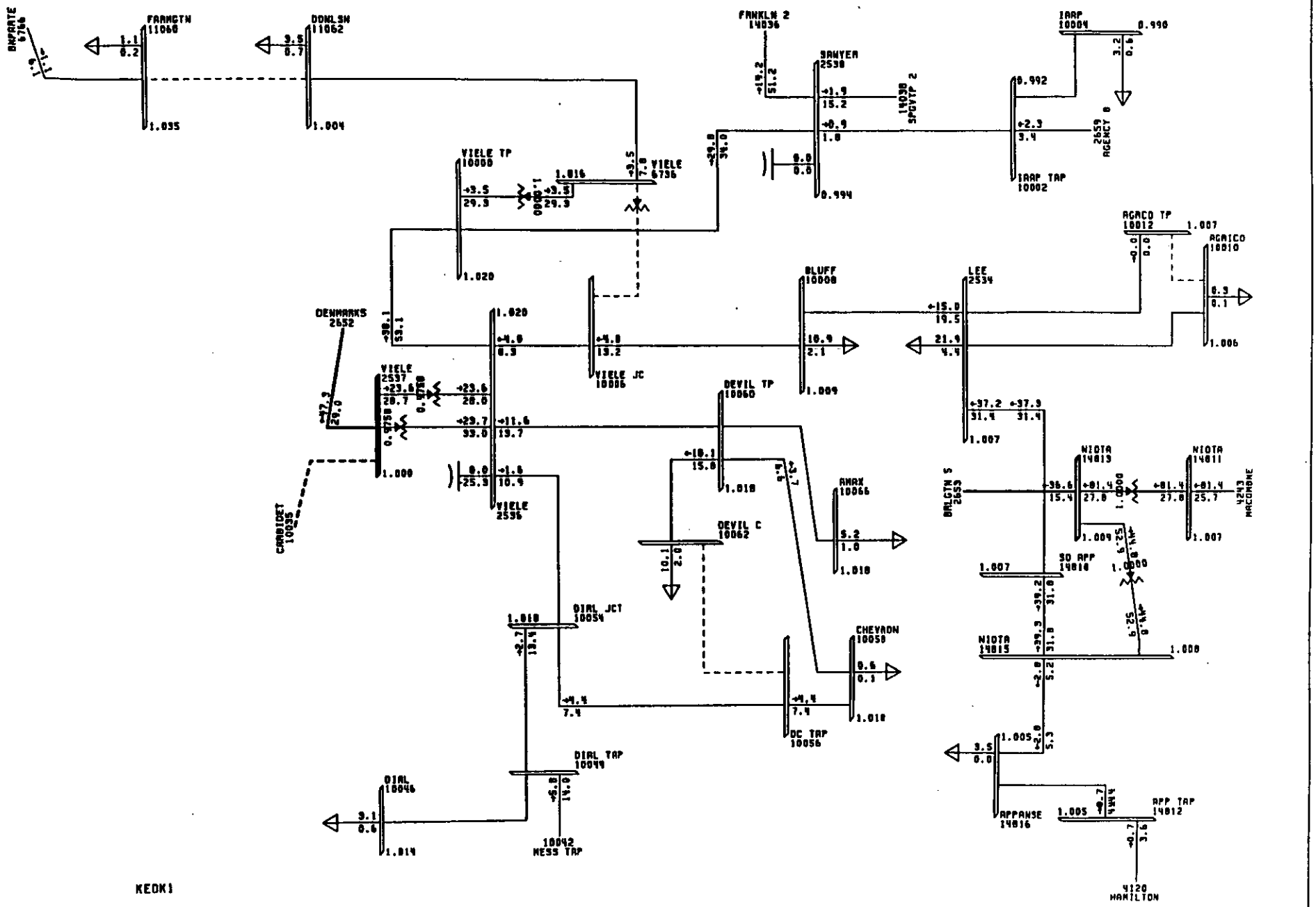
100% RATEA

0.925 UV 1.060 OV

BUS - VOLTAGE (PU)

BRANCH - MW/% OF RATE A

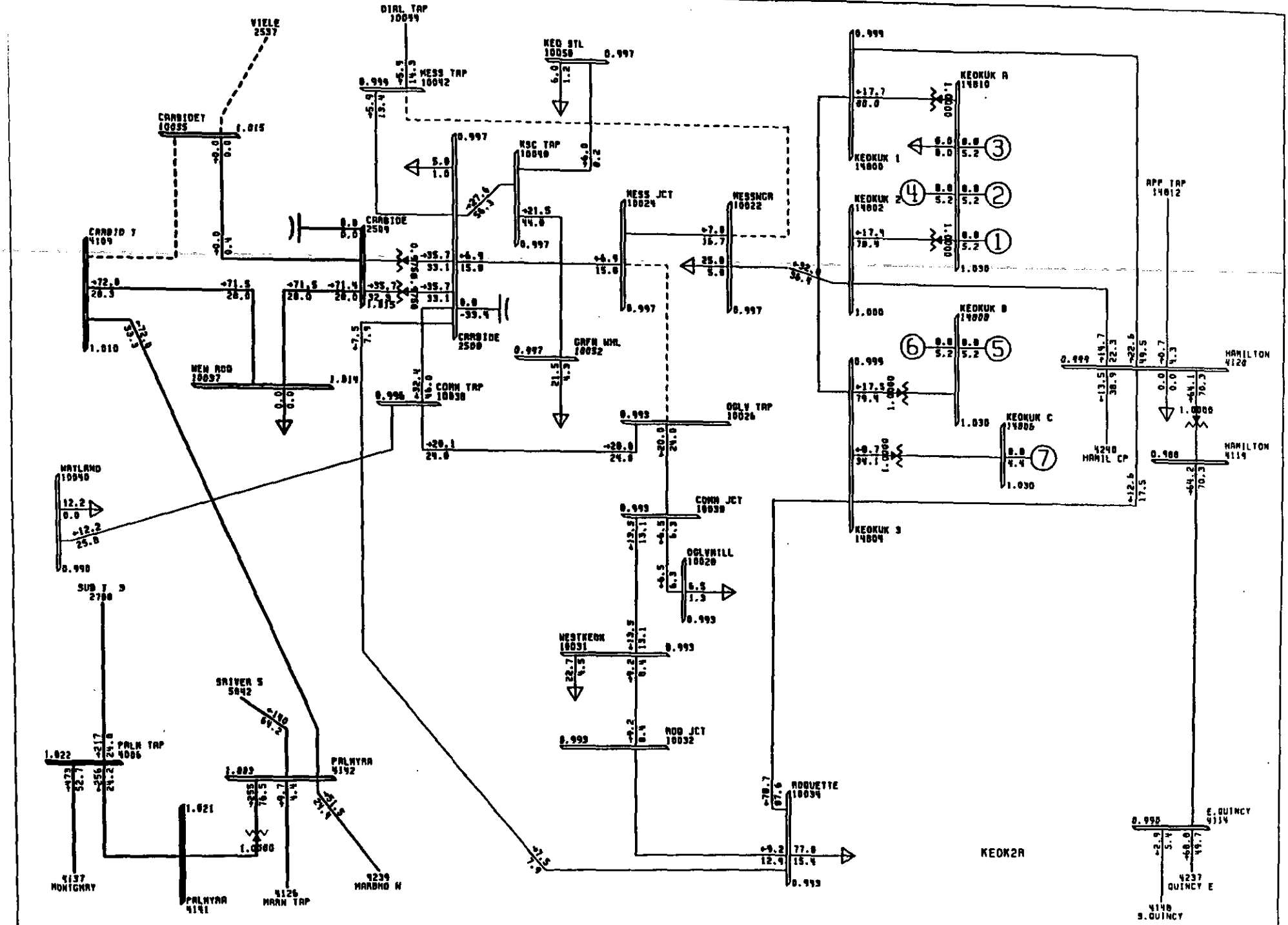
PM AR



1998B 69KV PLAN
CONT 5: LOSS OF CARBIDE - VIELE
EDT TUE 02 1995 15:49

100% RATEA
0.925 UV 1.060 OV
KV: ≤72 , ≤141 , ≤167

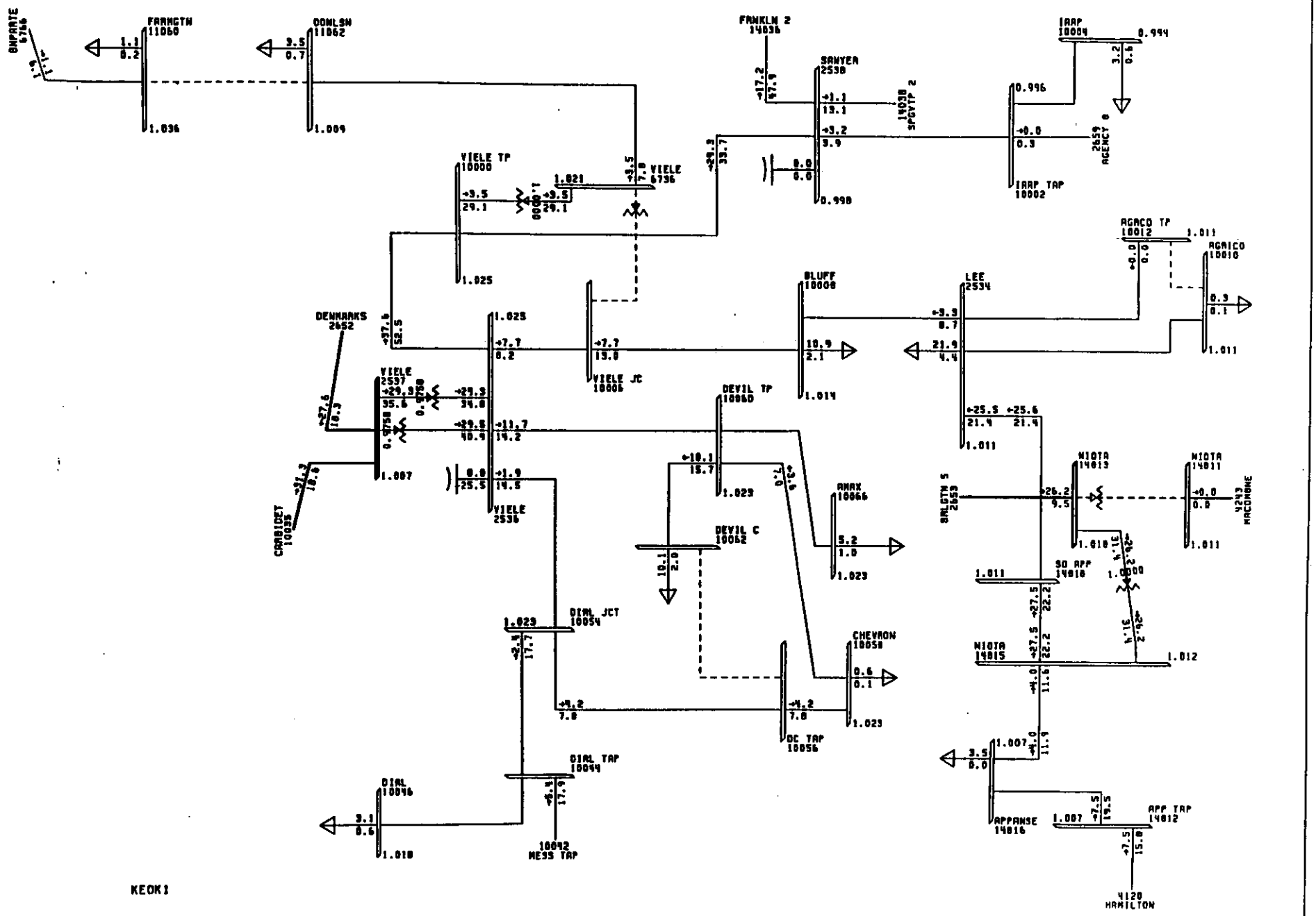
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



1998B 69KV PLAN
CONT 5: LOSS OF CARBIDE - VIELE

100% RATEA
0.925UV 1.060OV
KV: ≤14 67

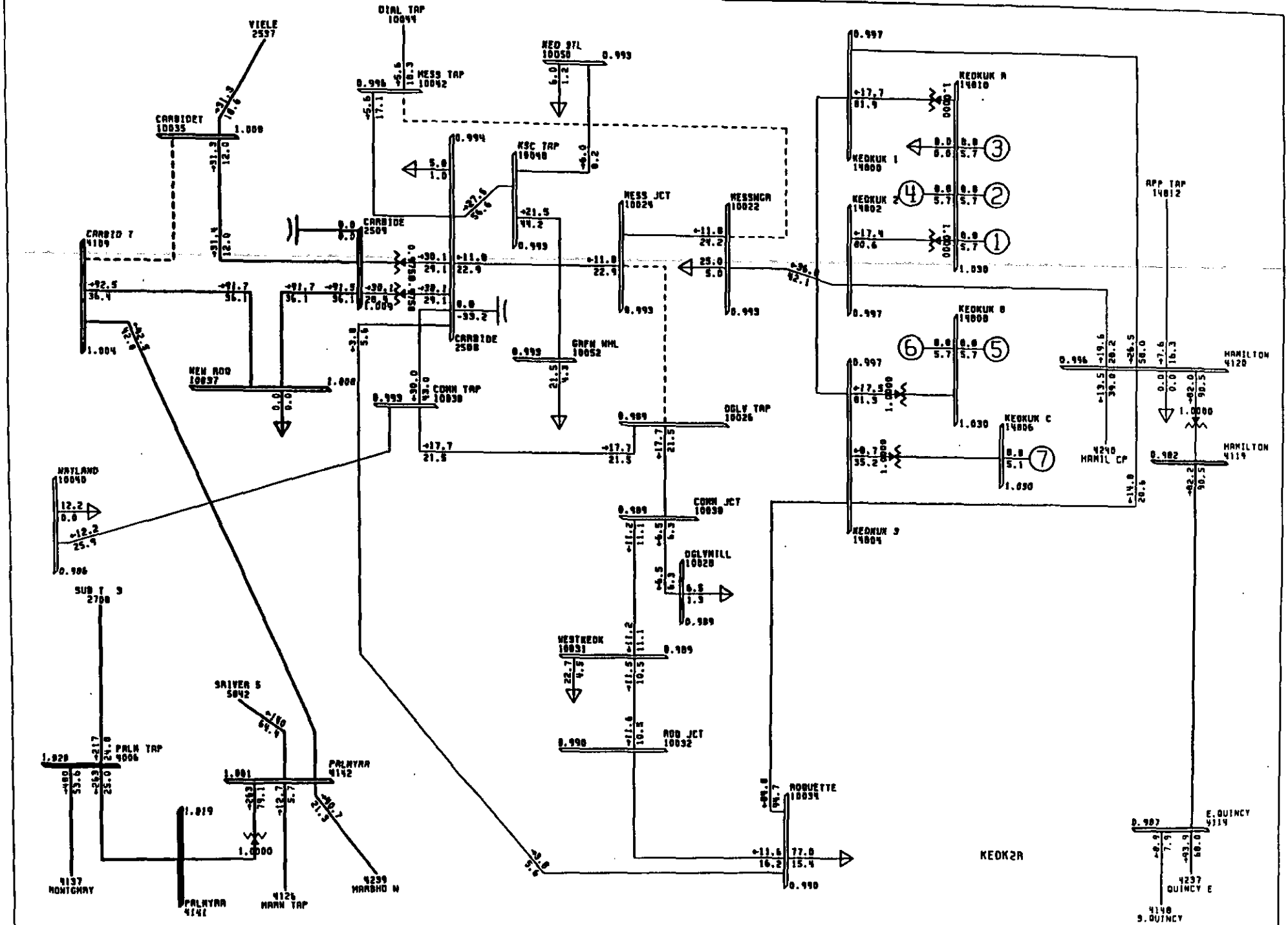
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



1998B 69KV PLAN
CONT 6: LOSS OF NIOTA XFMR

100% RATE A
0.925 UV 1.060 OV
KV: ≤72 ,≤141 ,≤167

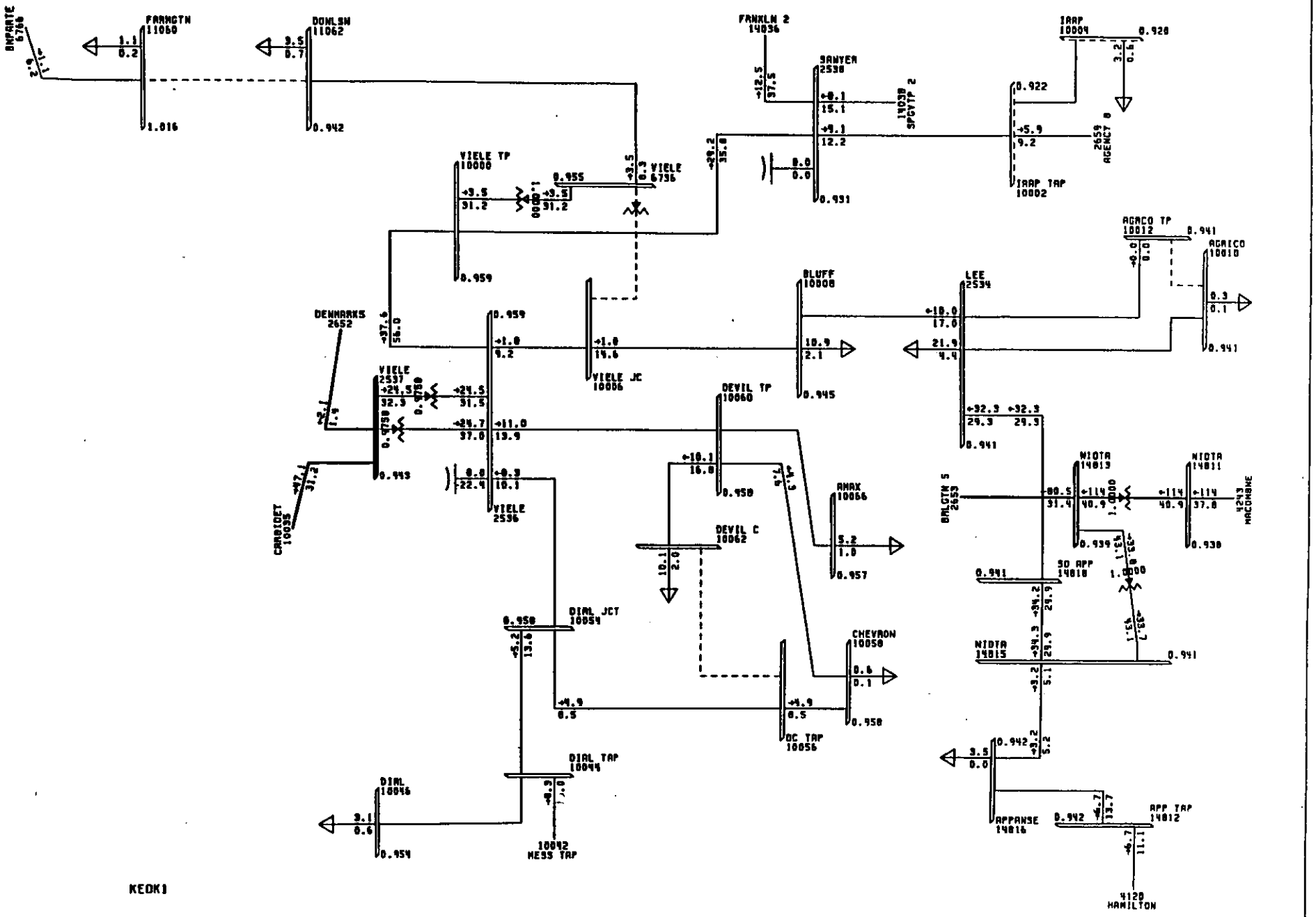
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



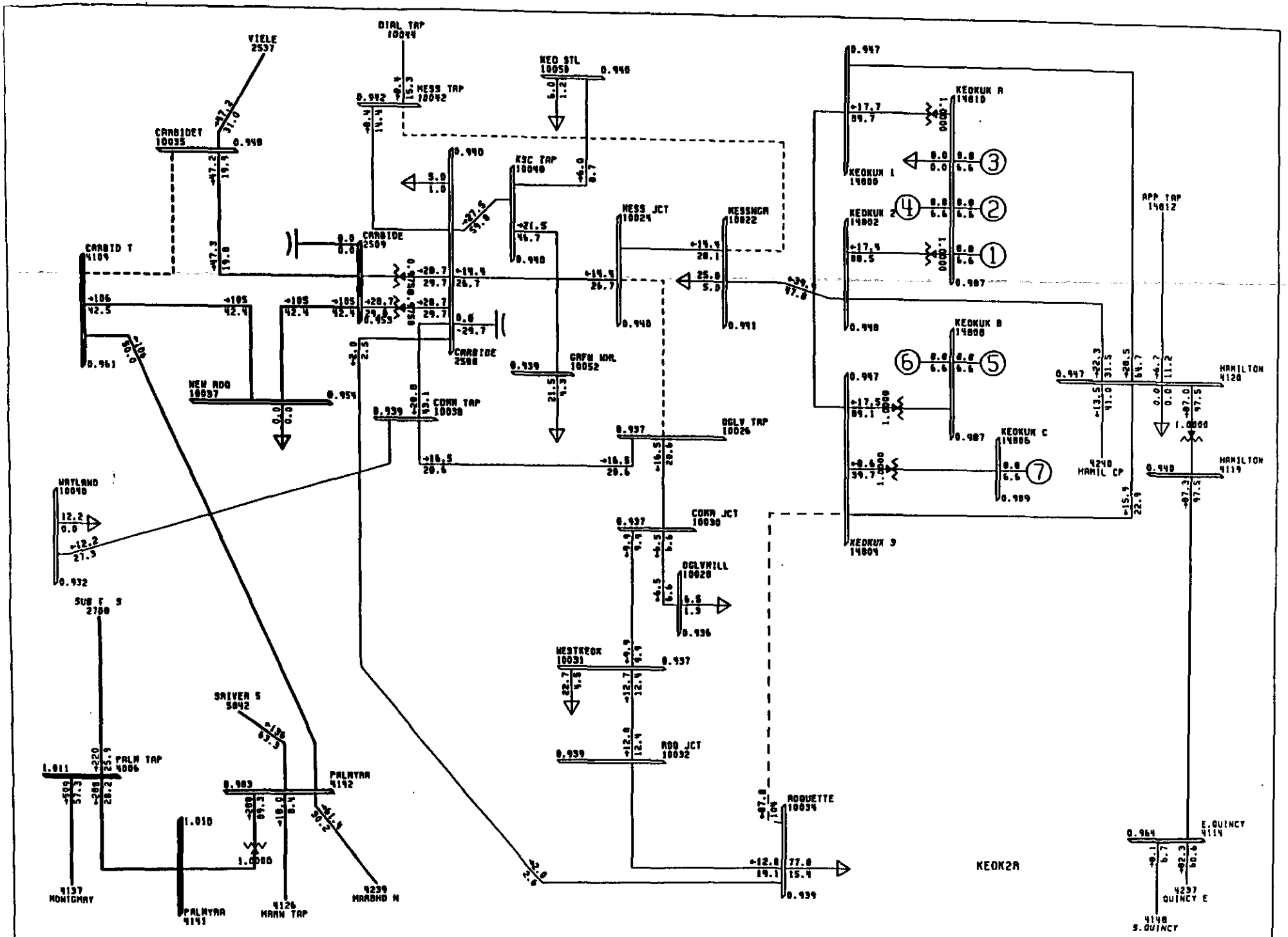
1998B 69KV PLAN
CONTG 6: LOSS OF NIOTA XFMR

100% RATEA
0.925 UV 1.060 OV

BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A



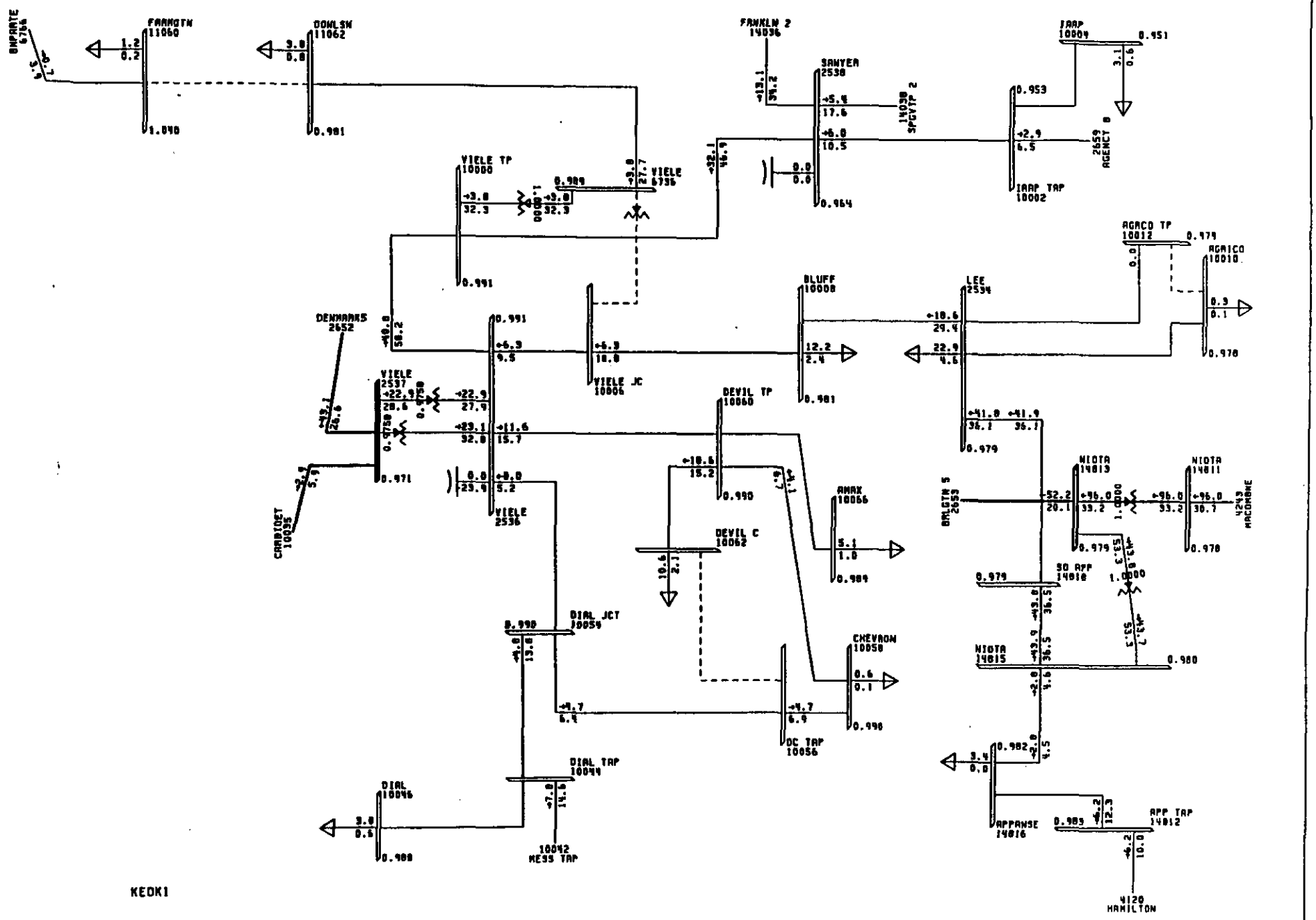
POWER TECHNOLOGIES,	1998B 69KV PLAN CONT 7: BGS OUTAGE FRI, JUN 02 1995 15:49	100% RATE A 0.925 UV 1.060 OV KV: ≤72 , ≤141 , ≤167	BUS - VOLTAGE (PU) BRANCH - MW/% OF RATE A EQUIPMENT - MW/MVAR



1998B 69KV PLAN
CONT 7: BGS OUTAGE

100% RATEA
0.925 UV 1.060 OV
KV: 141 67

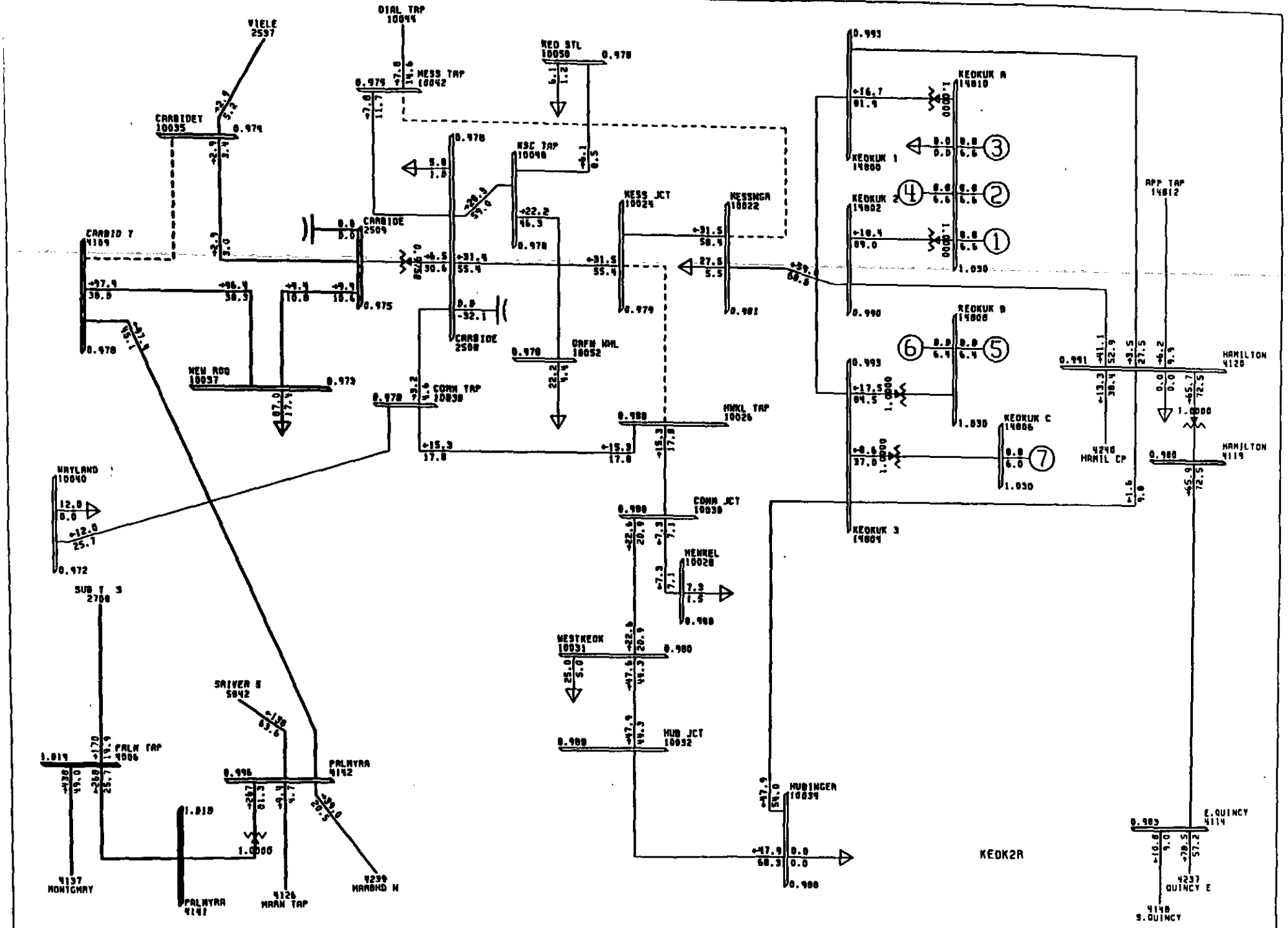
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



2006B 161KV PLAN
BASE CASE
FRI. JUN 02 1995 15:50

100% RATE A
0.925 UV 1.060 OV
KV: ≤72 , ≤141 , ≤167

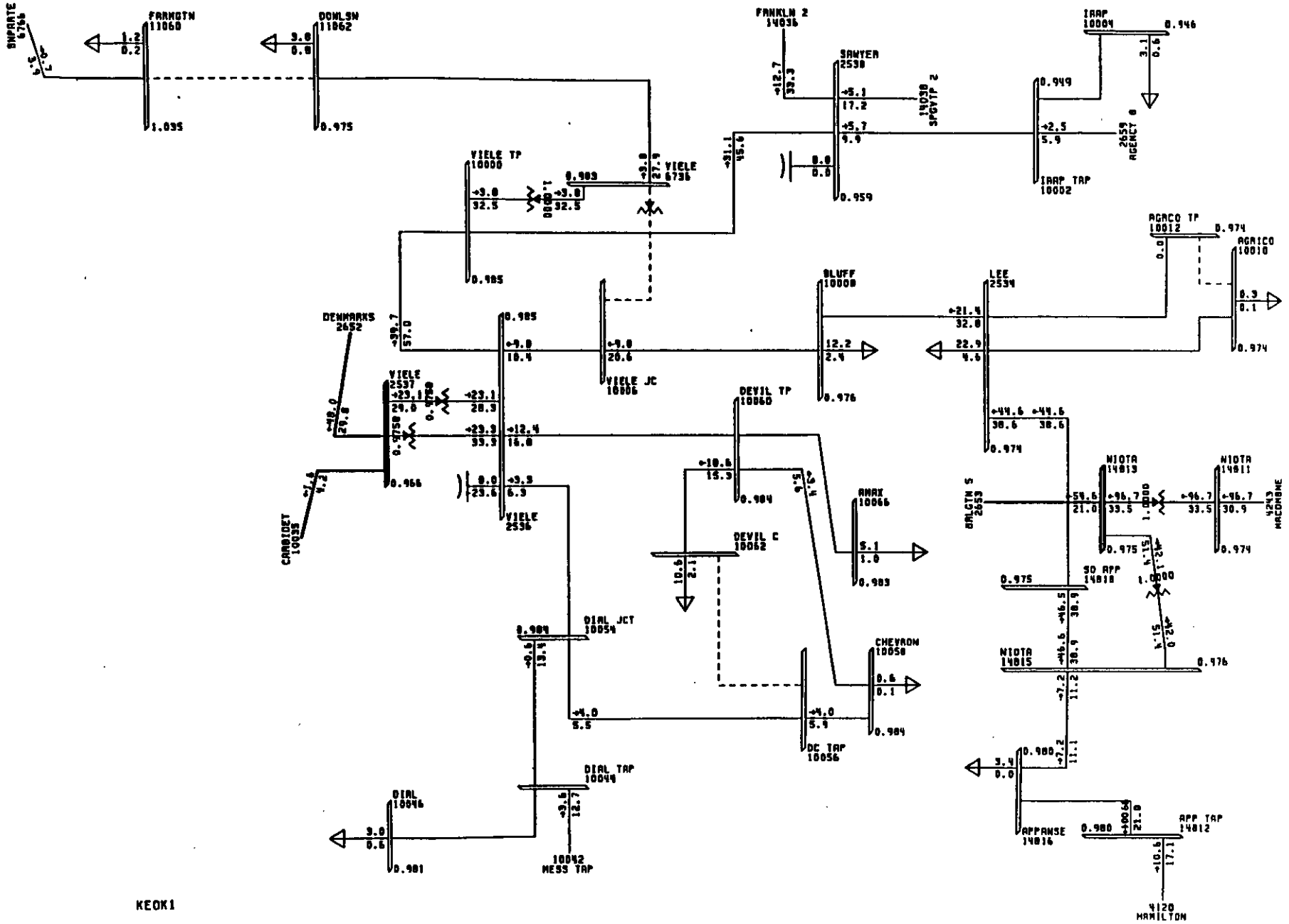
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



2006B 161KV PLAN
BASE CASE

100% RATE B
0.925 UV 1.060 OV
KV

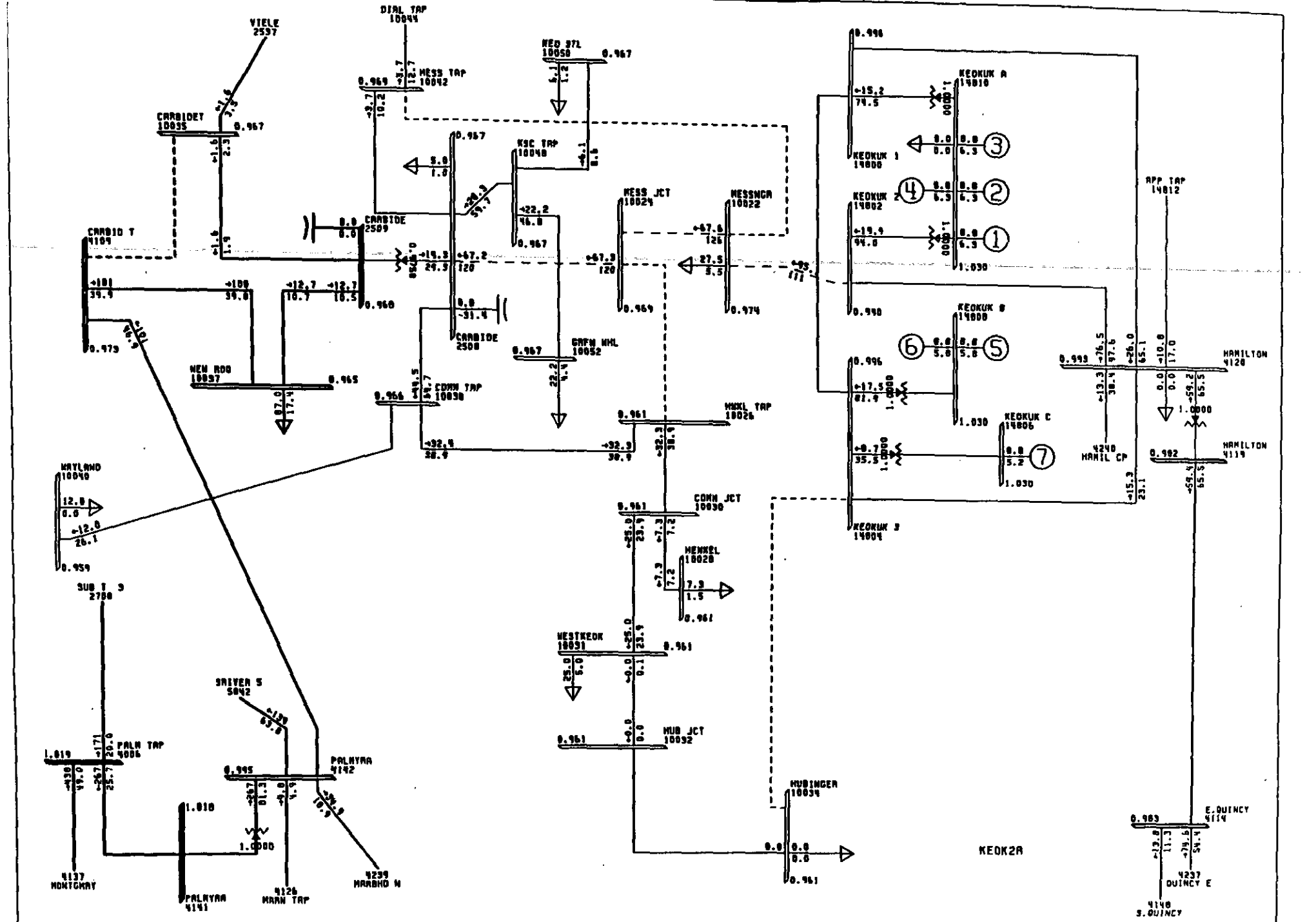
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



2006B 161KV PLAN
CONT 1: LOSS OF NEW HYDRO-ROQUETTE LINE
PDT TUE 02 1005 15:50

100% RATER
0.925UV 1.060OV
KV: ≤72 , ≤141 , ≤167

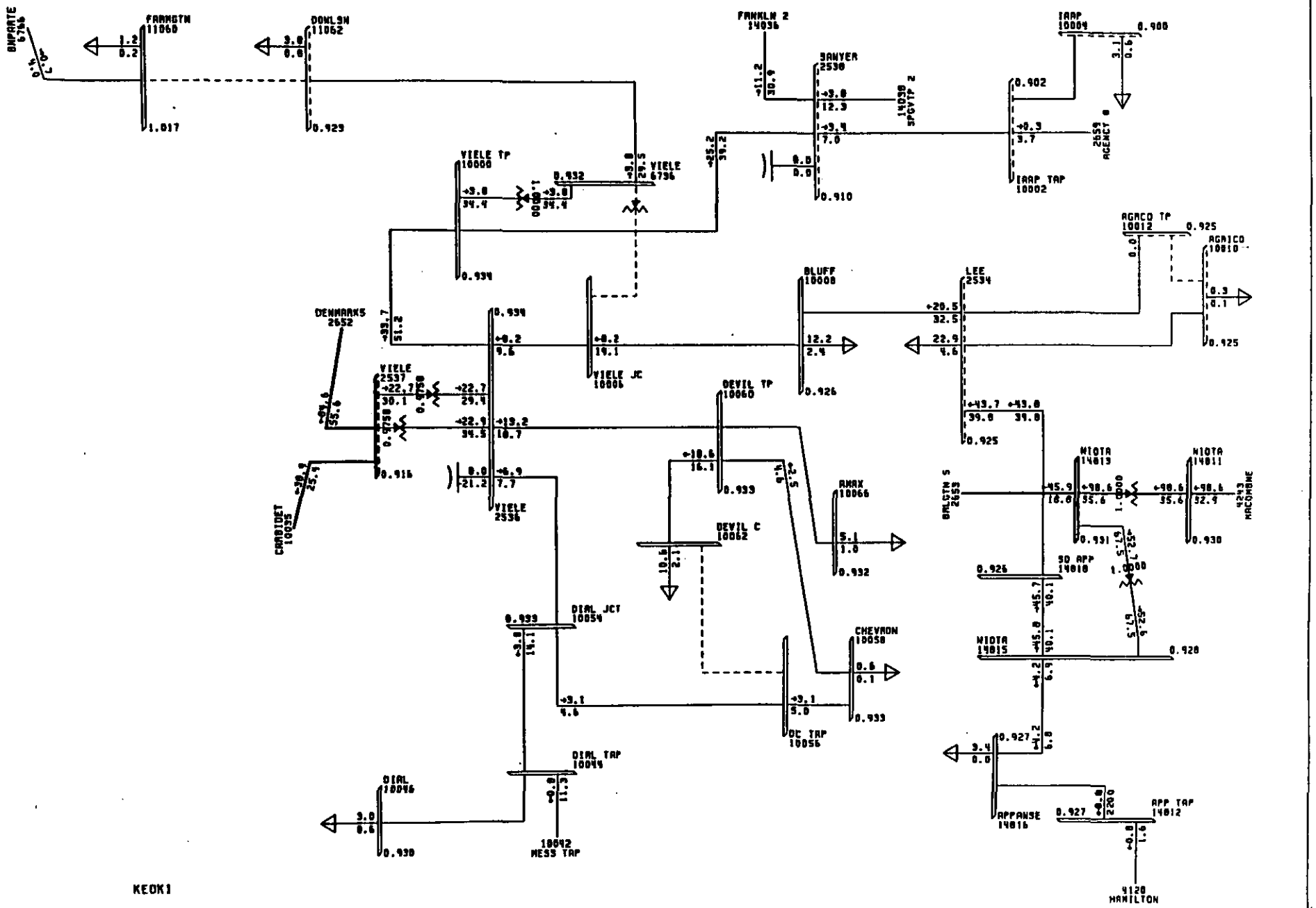
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



2006B 161KV PLAN
1: [illegible] NEW HYDRO ROQUETTE LINE

100% RATEA
0.925UV 1.060OV
KV [illegible] 67

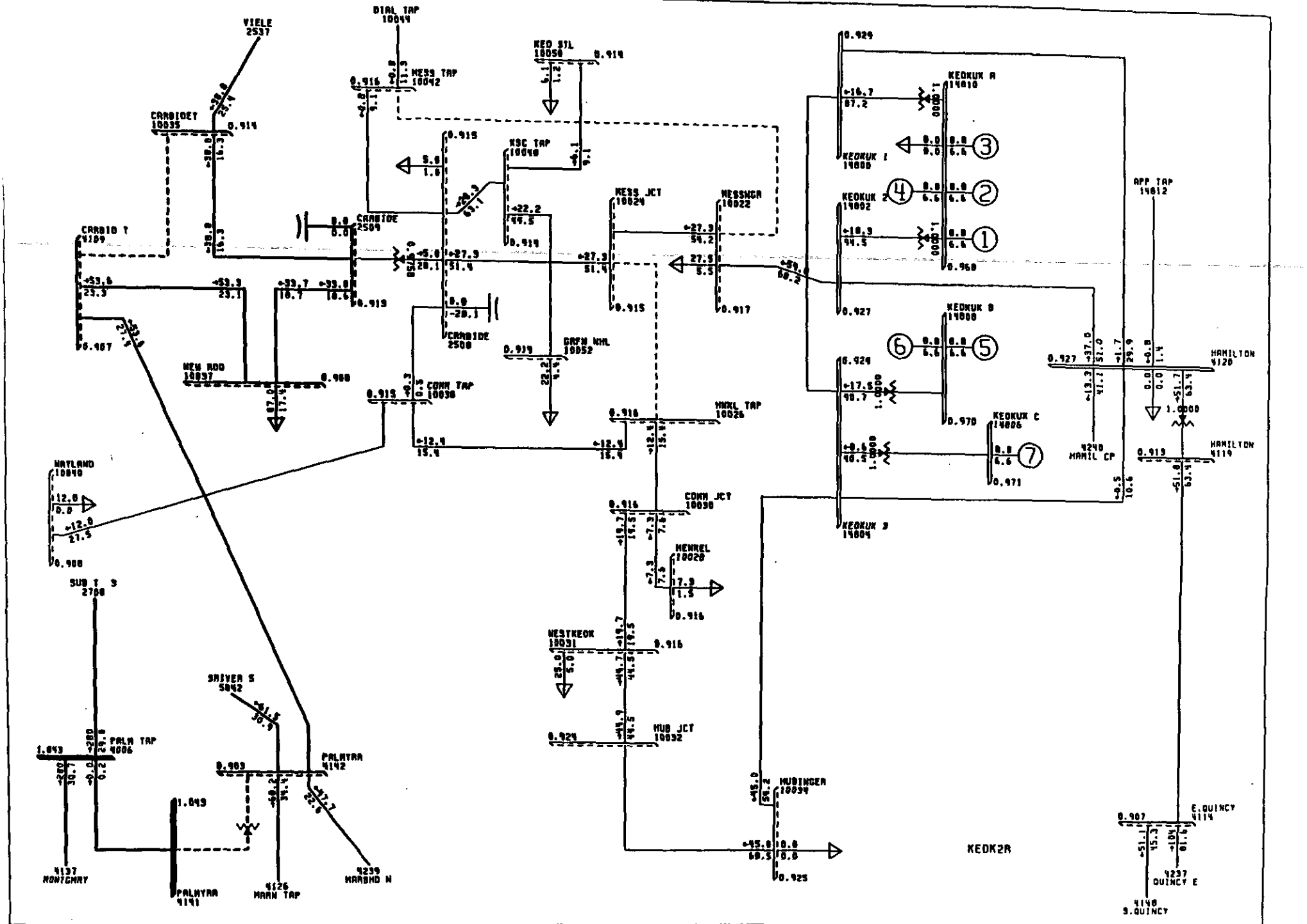
BUS - VOLTAGE(PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



2006B 161KV PLAN
CONT 2: LOSS OF PALMYRA 345/161
POWER
DAT JUN 02 1995 15:50

100% RATEA
0.925 UV 1.060 OV
KV: ≤72 , ≤141 , ≤167

BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



2006B 161KV PLAN

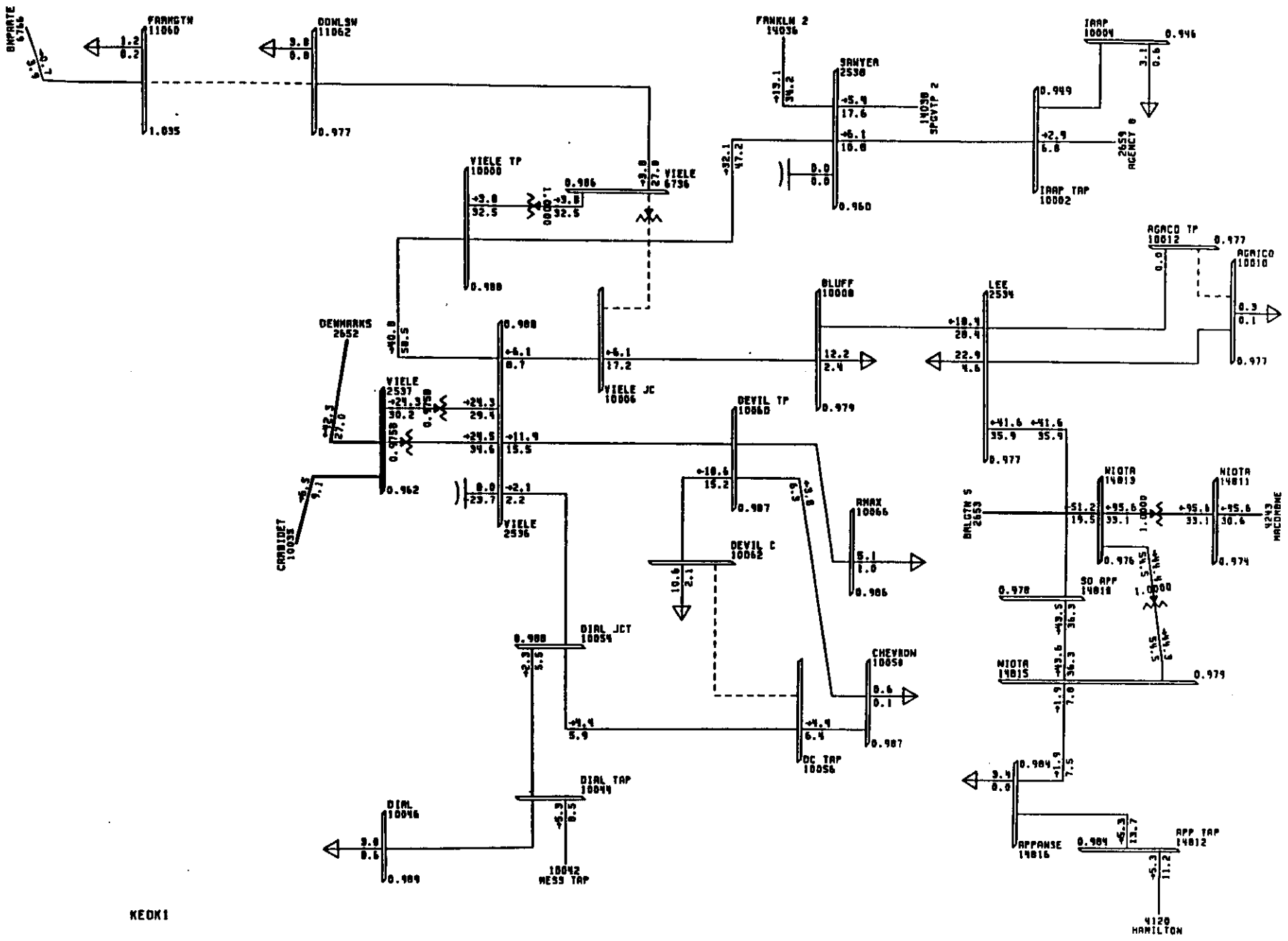
CROSS OF PALMYRA 345/161

100% RATER

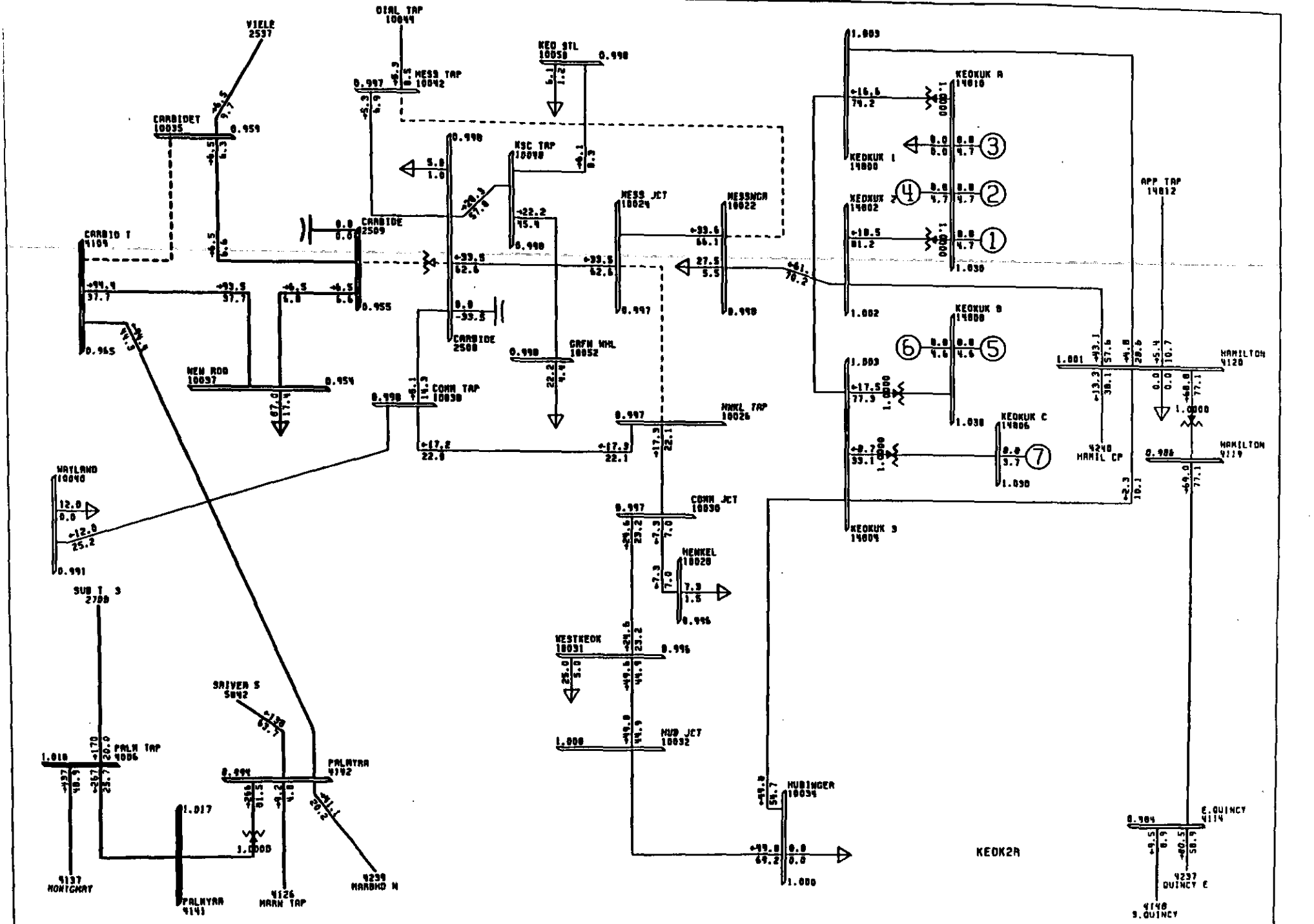
0.925 UV 1.060 OV

BUS - VOLTAGE (PU)

BRANCH - MW/% OF RATE A



POWER TECHNOLOGIES, INC.	2006B 161KV PLAN CONT 3: LOSS OF CARBIDE XFMR FRI, JUN 02 1995 15:51	100% RATER 0.925 UV 1.060 OV KV: ≤72 , ≤141 , ≤167	BUS - VOLTAGE (PU) BRANCH - MW/% OF RATE A EQUIPMENT - MW/MVAR



2006B 161KV PLAN

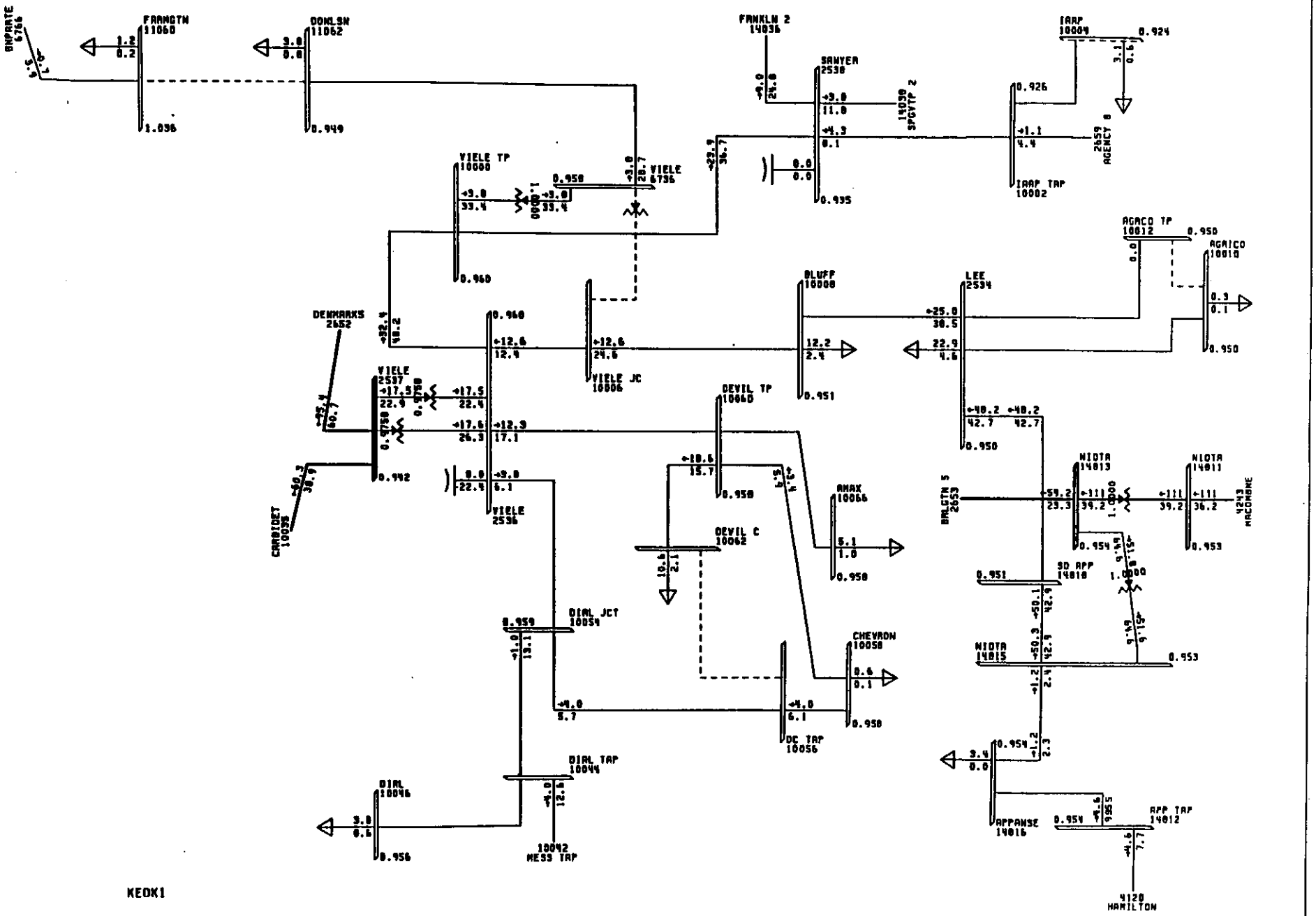
3 [illegible] CARBIDE XFMR

100% RATEA
0.925 UV 1.060 OV

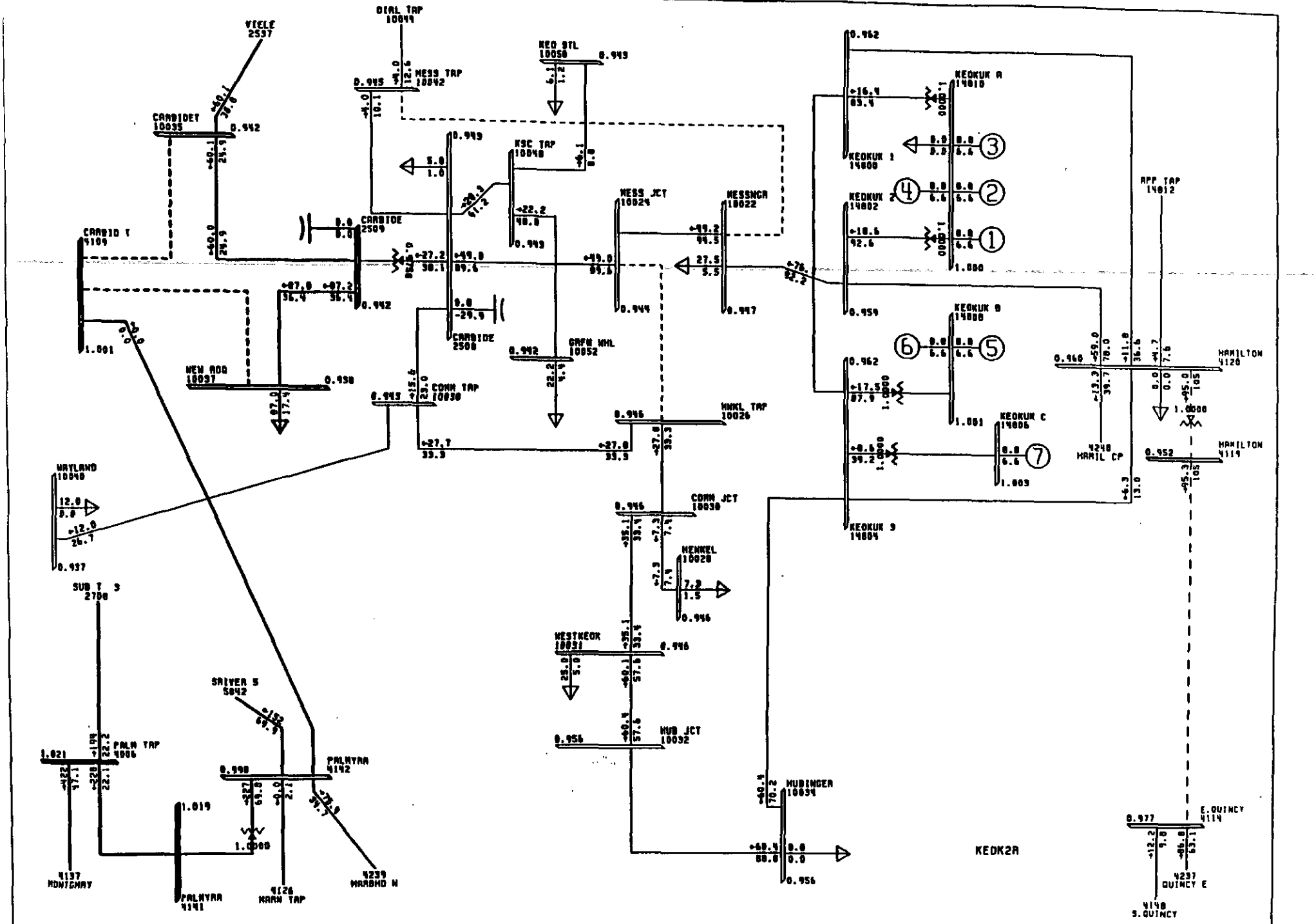
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A

[illegible] PM[illegible] - [illegible] AR [illegible]

1



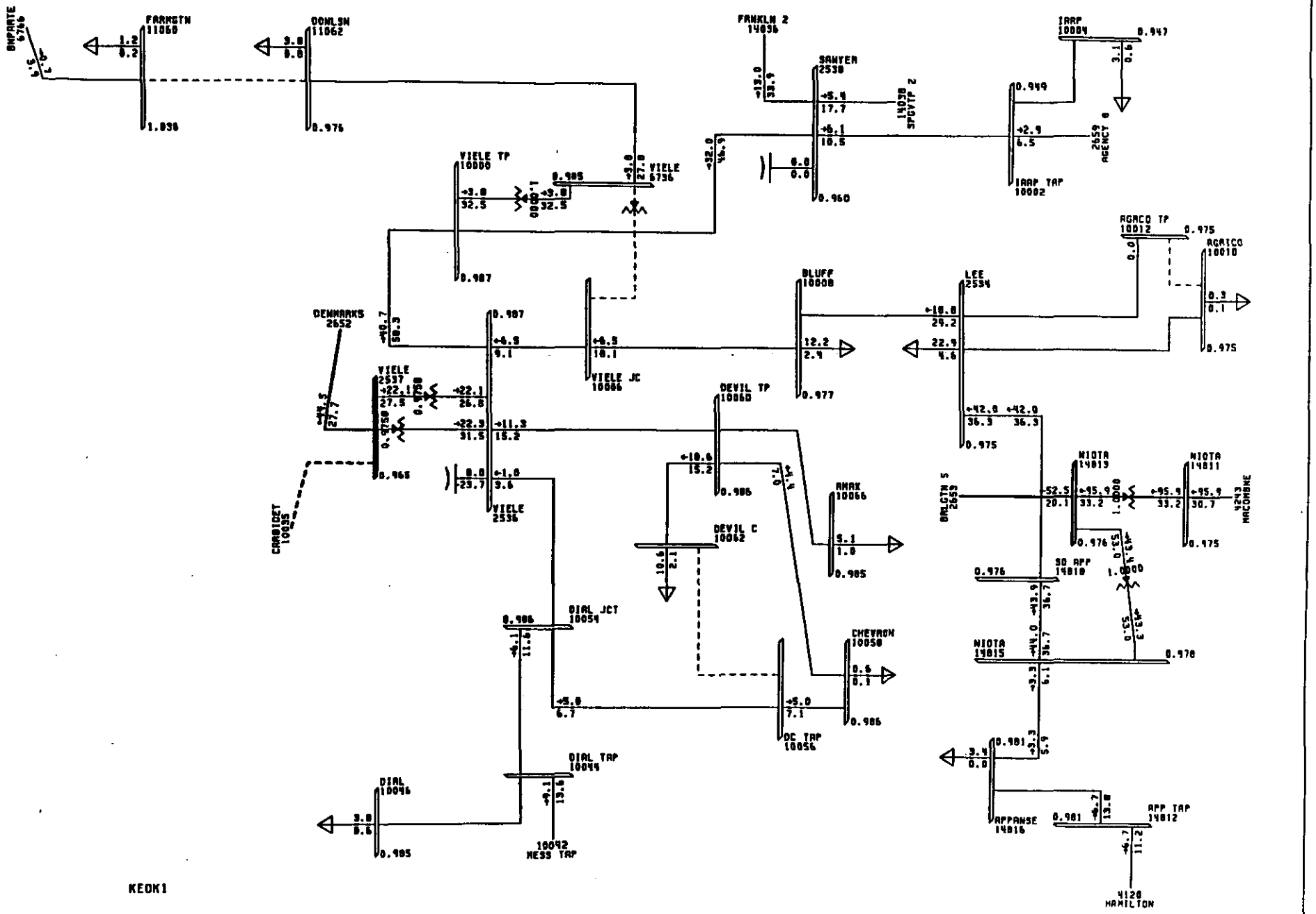
POWER TECHNOLOGIES	2006B 161KV PLAN CONT 4: LOSS OF CARBIDE T - NEW ROQUETTE FRI, JUN 02 1995 15:51	100% RATER 0.925 UV 1.060 OV KV: ≤72 , ≤141 , ≤167	BUS - VOLTAGE (PU) BRANCH - MW/% OF RATE A EQUIPMENT - MW/MVAR



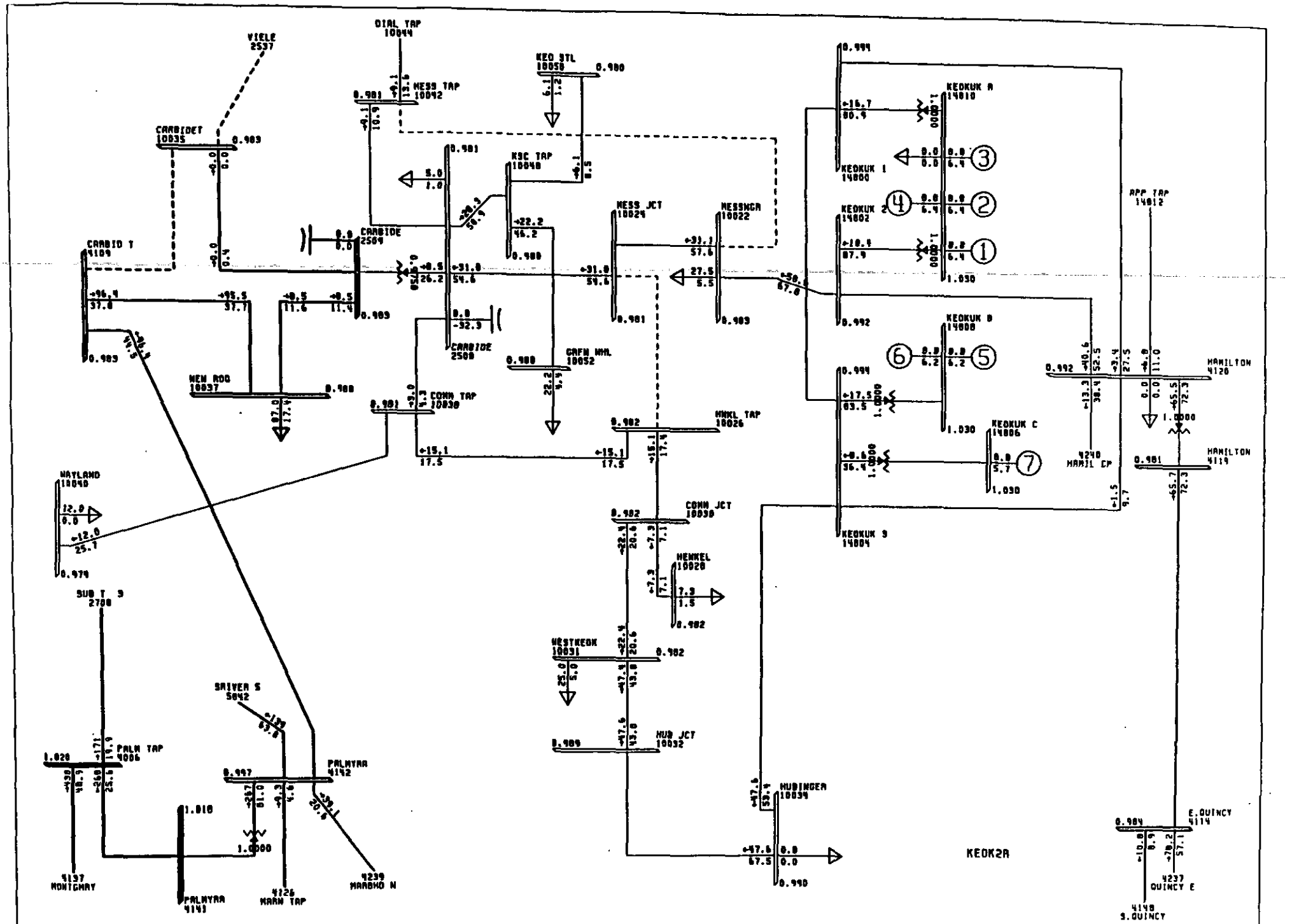
2006B 161KV PLAN
CONT 4: LOSS OF CARBIDE T - NEW ROQUETTE

100% RATE A
0.925 UV 1.060 OV
KV: ≤72 ≤141 ≤167

BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



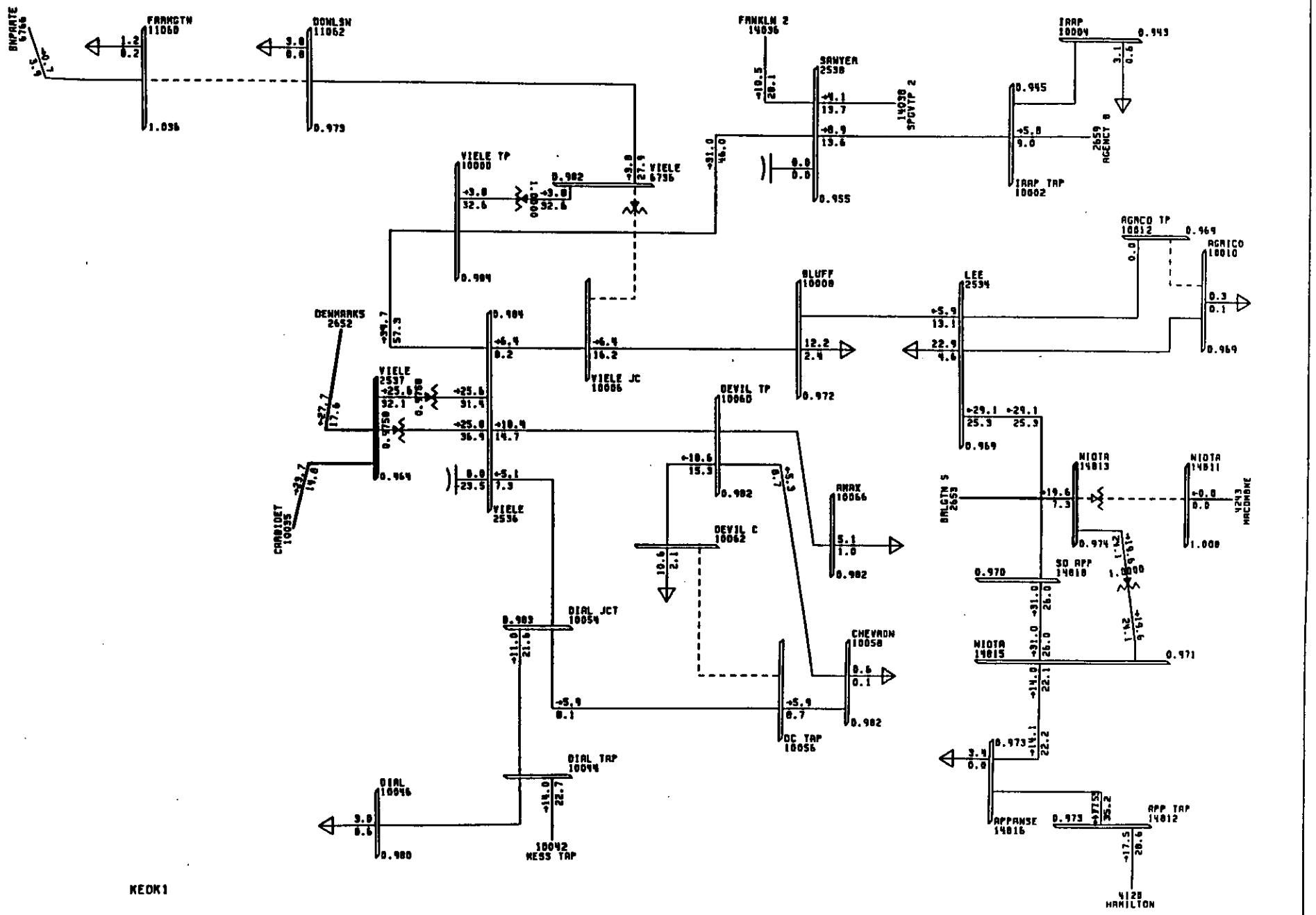
POWER TECHNOLOGIES, INC.	2006B 161KV PLAN CONT 5: LOSS OF CARBIDE - VIELE FRI, JUN 02 1995 15:51	100% RATEA 0.925 UV 1.060 OV KV: ≤72 , ≤141 , ≤167	BUS - VOLTAGE (PU) BRANCH - MW/% OF RATE A EQUIPMENT - MW/MVAR



2006B 161KV PLAN
CONT 5: LOSS OF CARBIDE - VIELE

100% RATED
0.925UV 1.060OV
KV

BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR

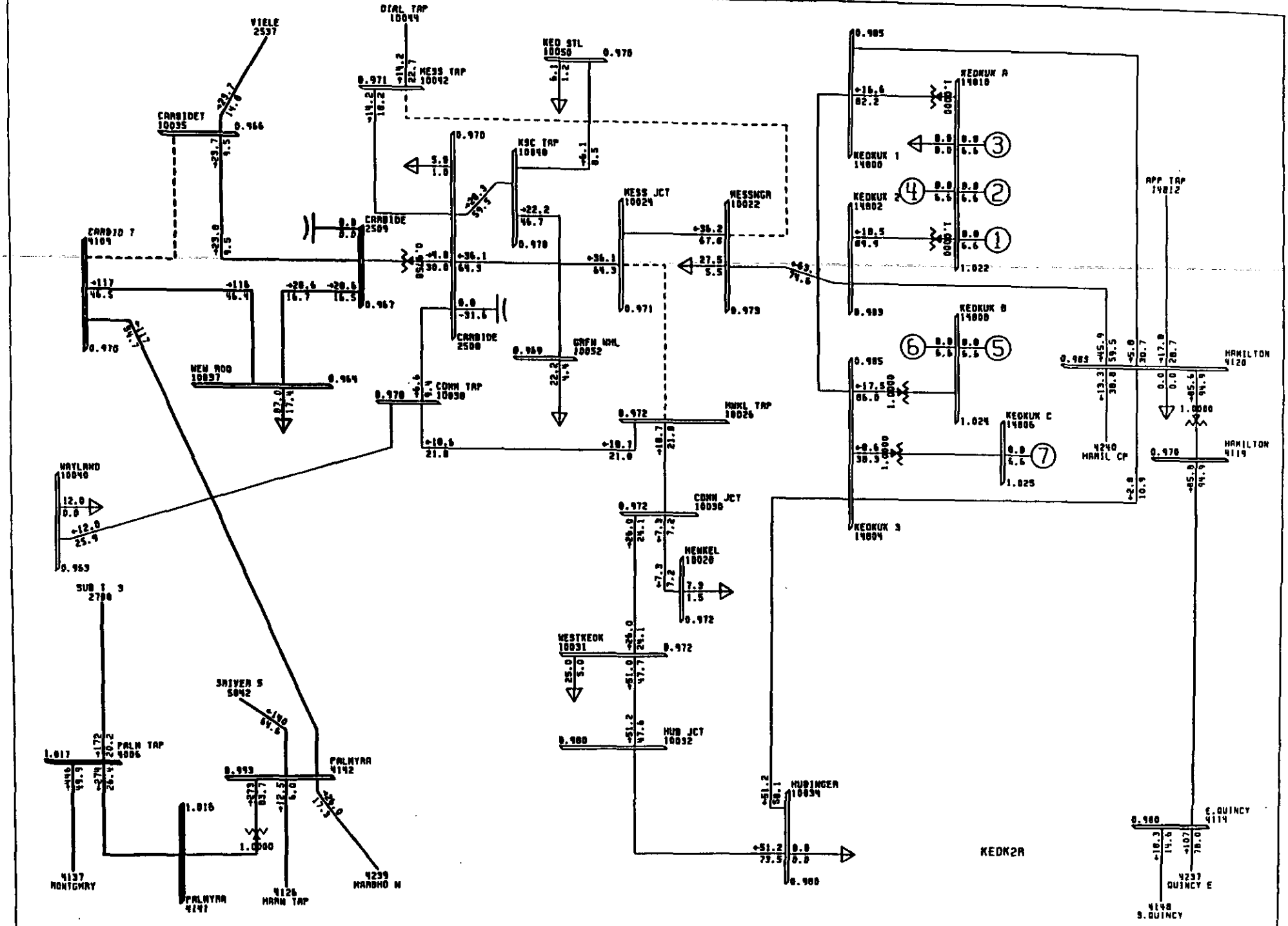


2006B 161KV PLAN
CONT 6: LOSS OF NIOTA XFMR
FRI, JUN 02 1995 15:51

POWER TECHNOLOGIES, INC.

100% RATER
0.925 UV 1.060 OV
KV: ≤72 , ≤141 , ≤167

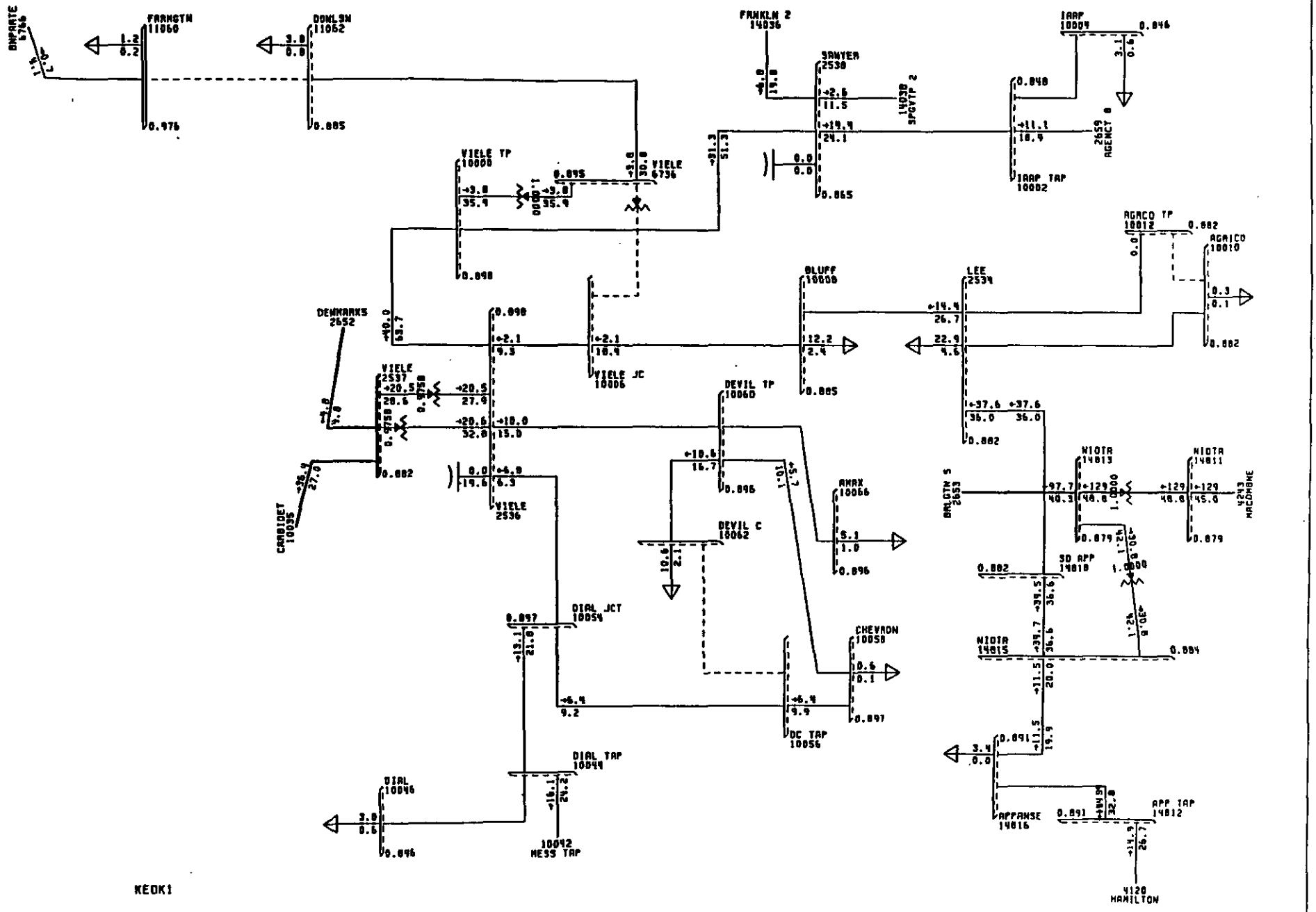
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



2006B 161KV PLAN
CONT 6: LOSS OF NIOTA XFMR

100% RATEA
0.925UV 1.060OV
KV

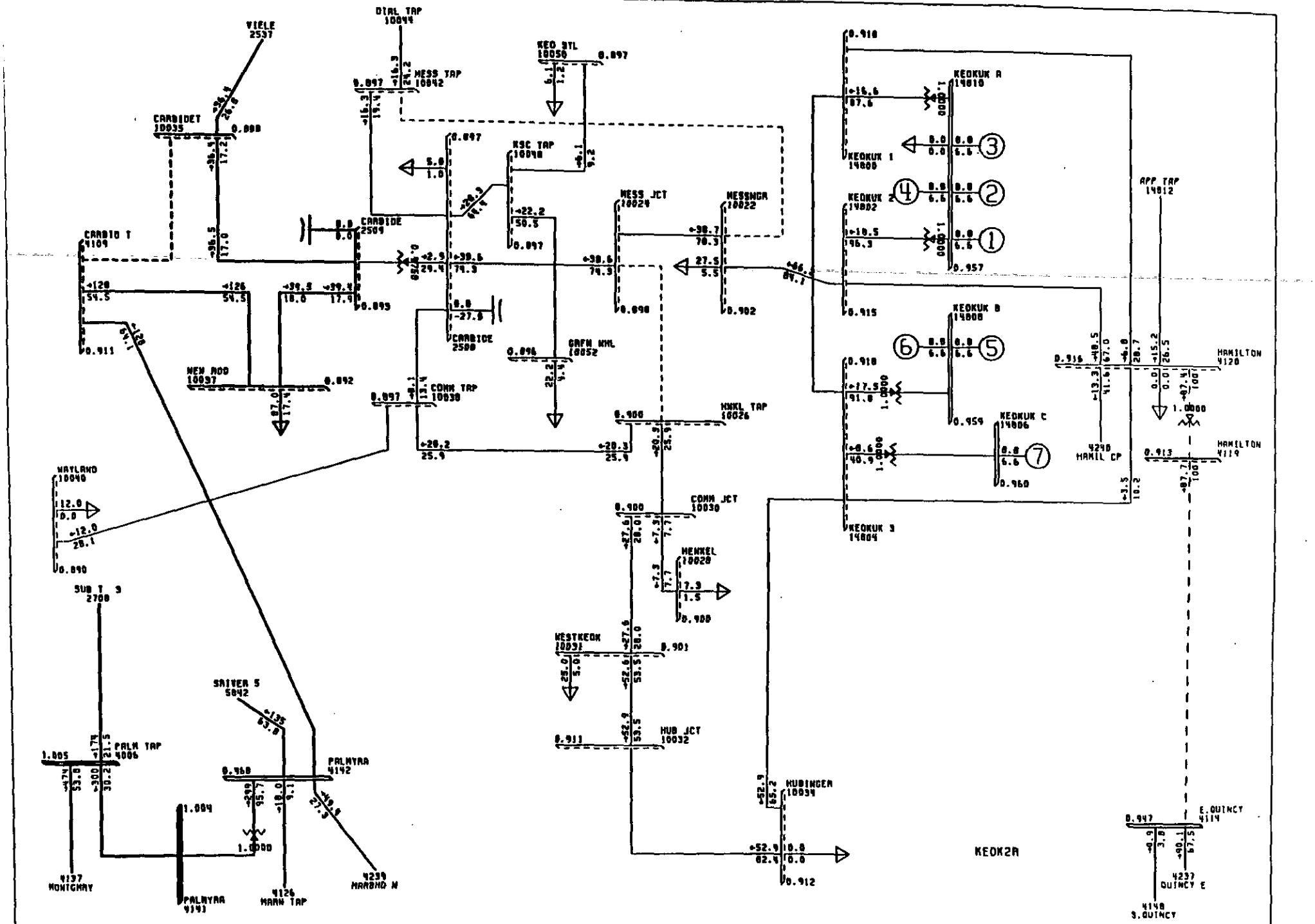
BUS - VOLTAGE(PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



2006B 161KV PLAN
CONT 7: BGS OUTAGE
MON ,JUN 05 1995 08:11

100% RATEA
0.925 UV 1.060 OV
KV; ≤72 ,≤141 ,≤167

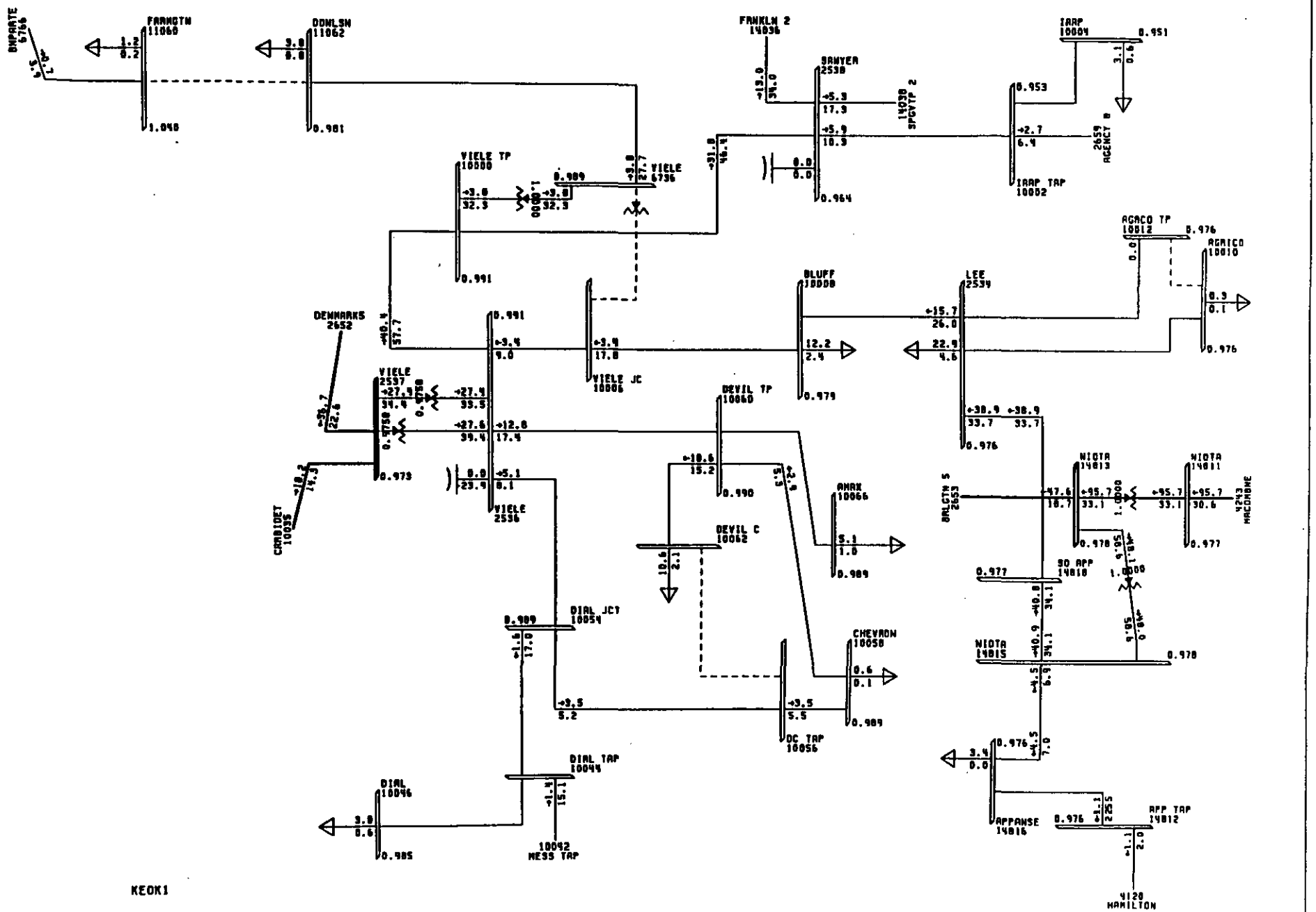
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



2006B 161KV PLAN
CONT 7: BGS OUTAGE

100% RATED
0.925 UV 1.060 OV

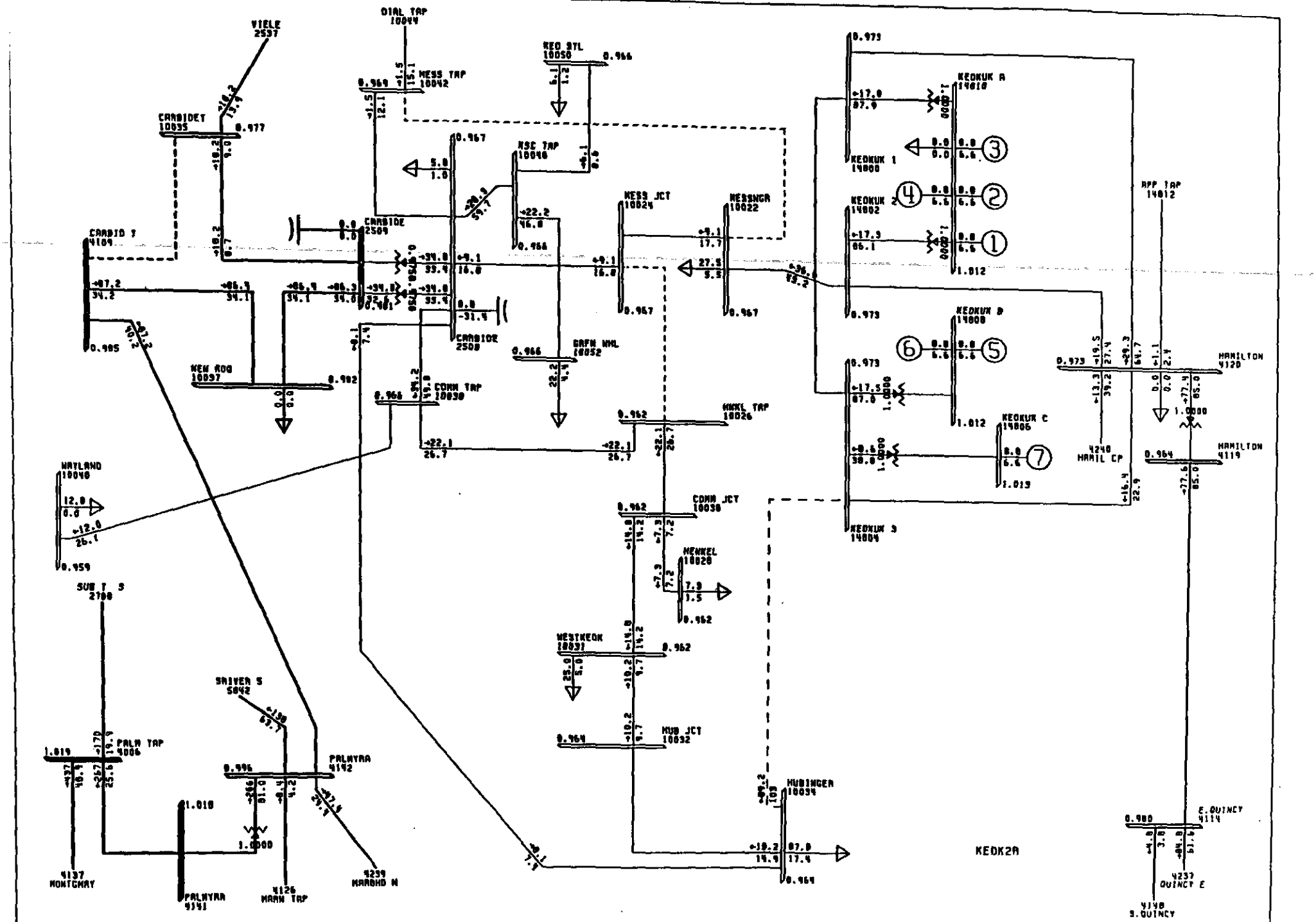
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



2006B 69KV PLAN
BASE CASE

100% RATER
0.925 UV 1.060 OV
KV: ≤72 ,≤141 ,≤167

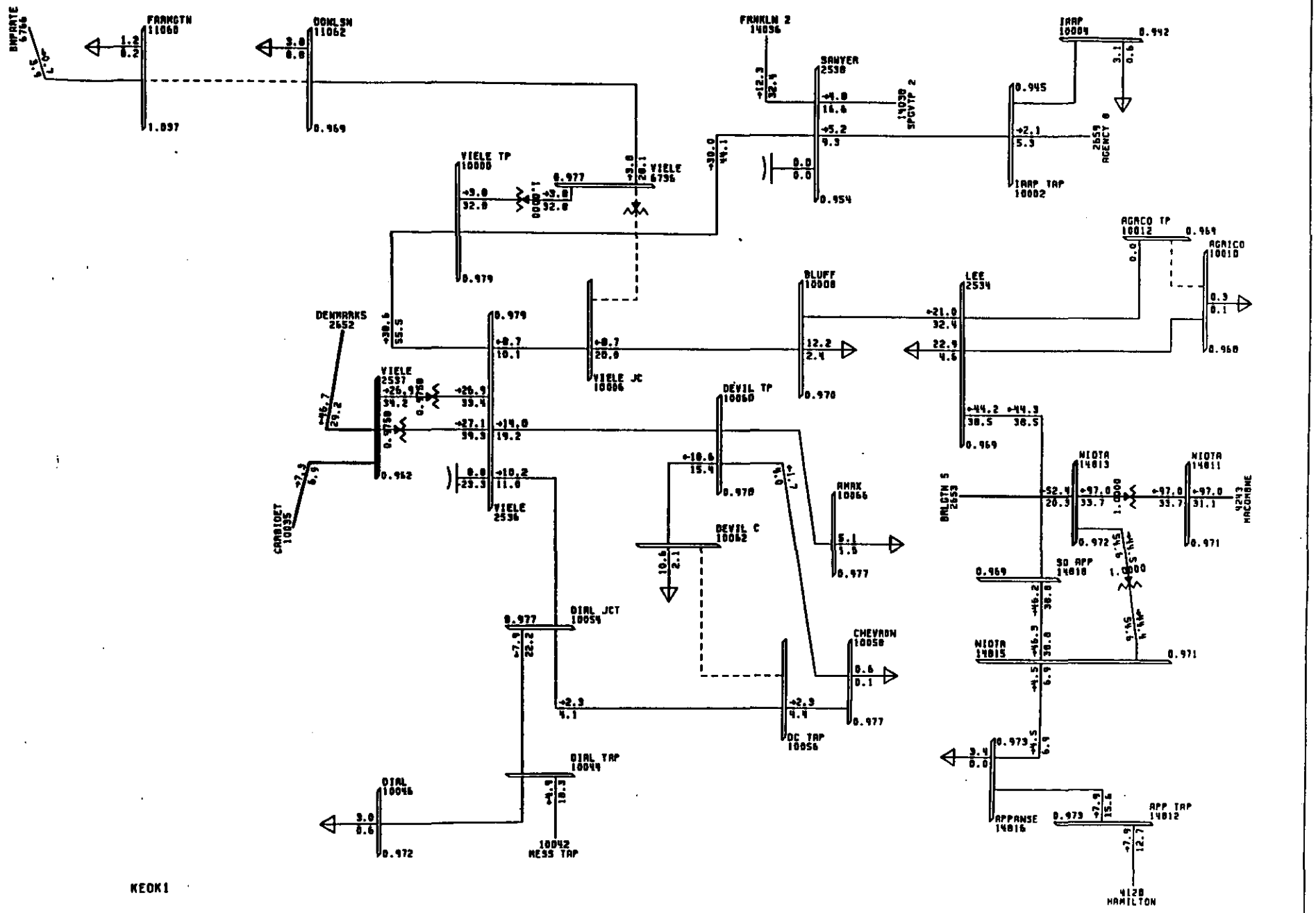
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



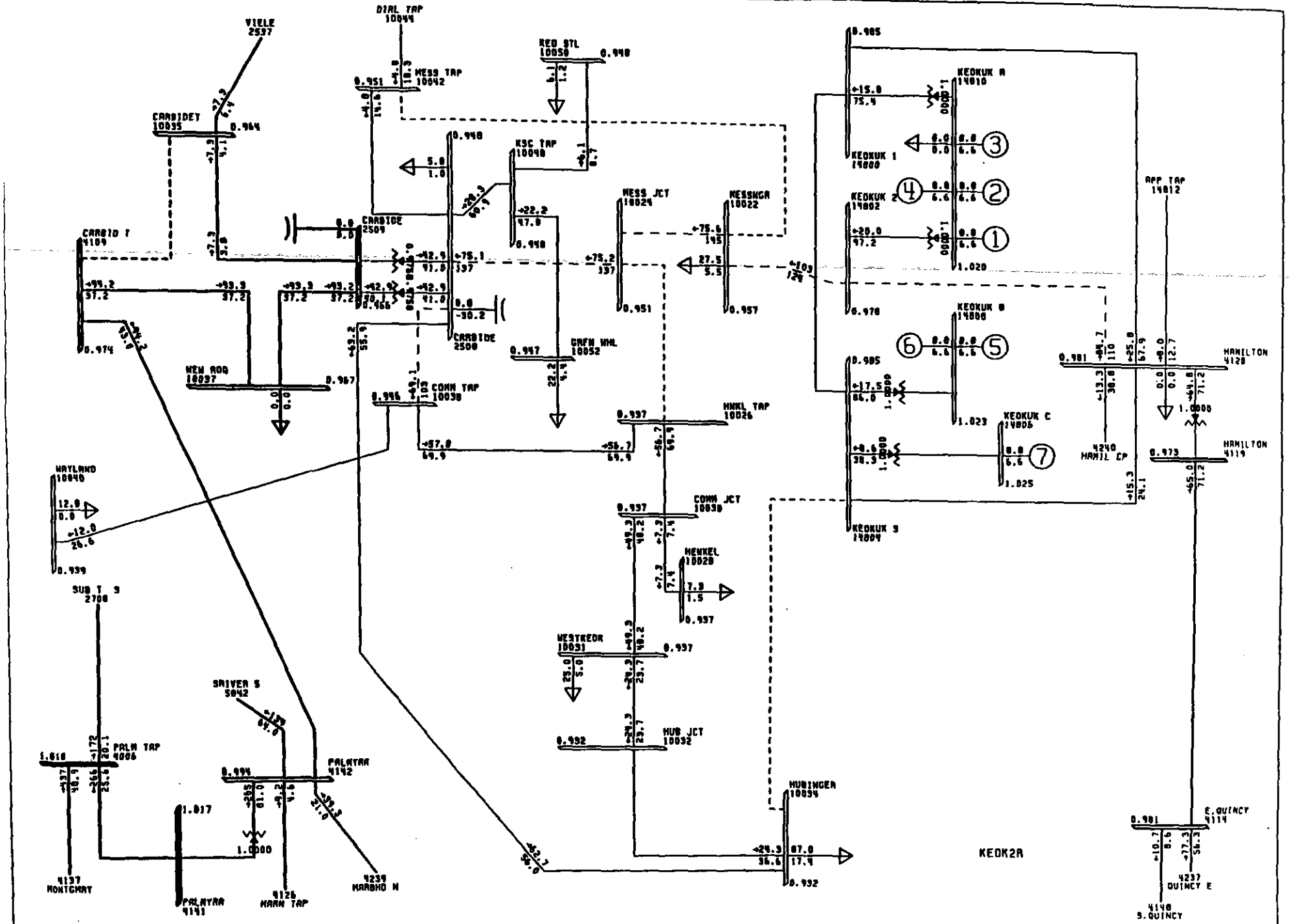
2006B 69KV PLAN

100% RATEA
0.925UV 1.060OV

BUS - VOLTAGE(PU)
BRANCH - MW/% OF RATE A



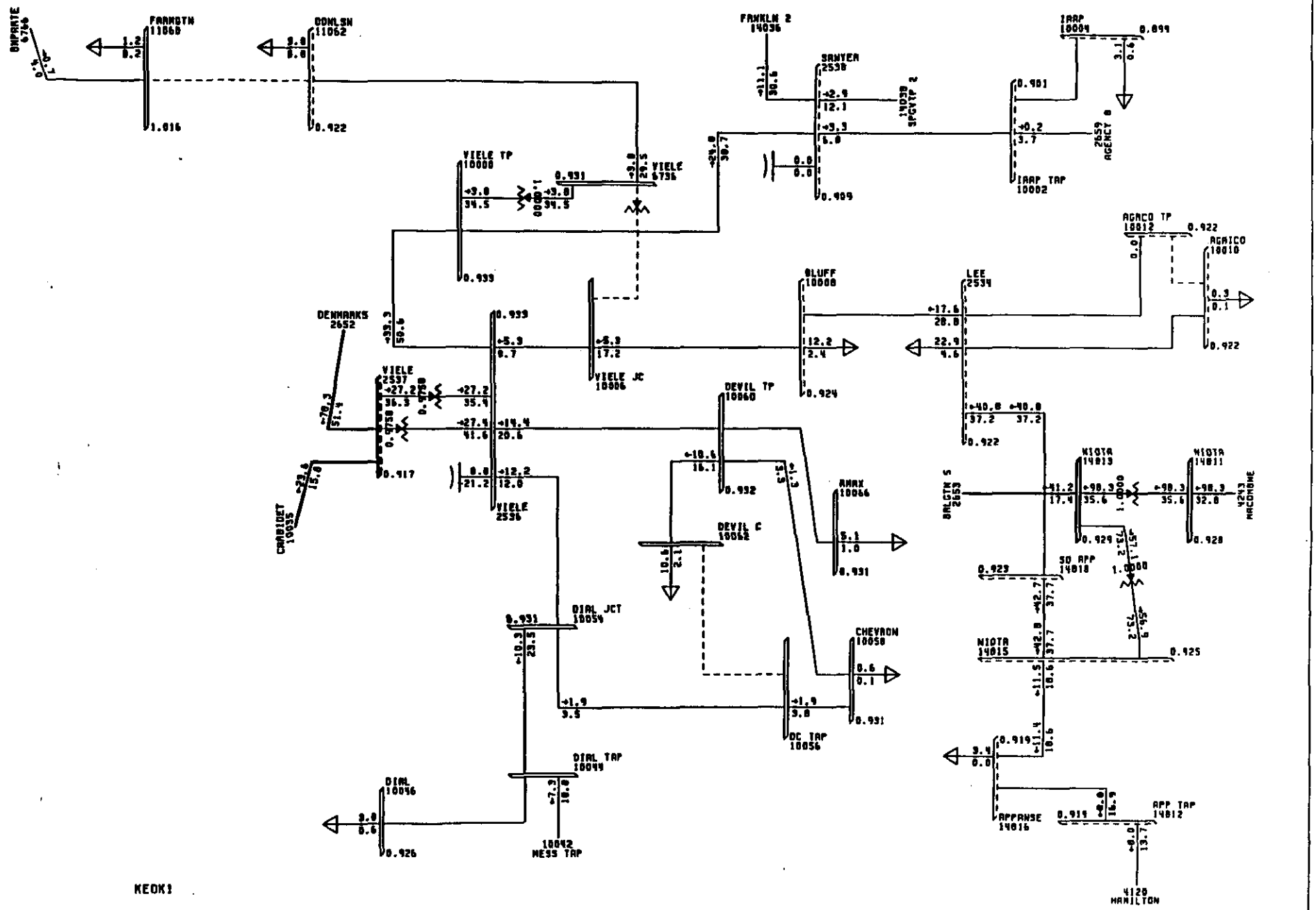
POWER TECHNOLOGIES	2006B 69KV PLAN CONT 1: LOSS OF NEW HYDRO-ROQUETTE LINE FRI, JUN 02 1995 16:06	100% RATEA 0.925UV 1.060 OV KV: ≤72 , ≤141 , ≤167	BUS - VOLTAGE(PU) BRANCH - MW/% OF RATE A EQUIPMENT - MW/MVAR



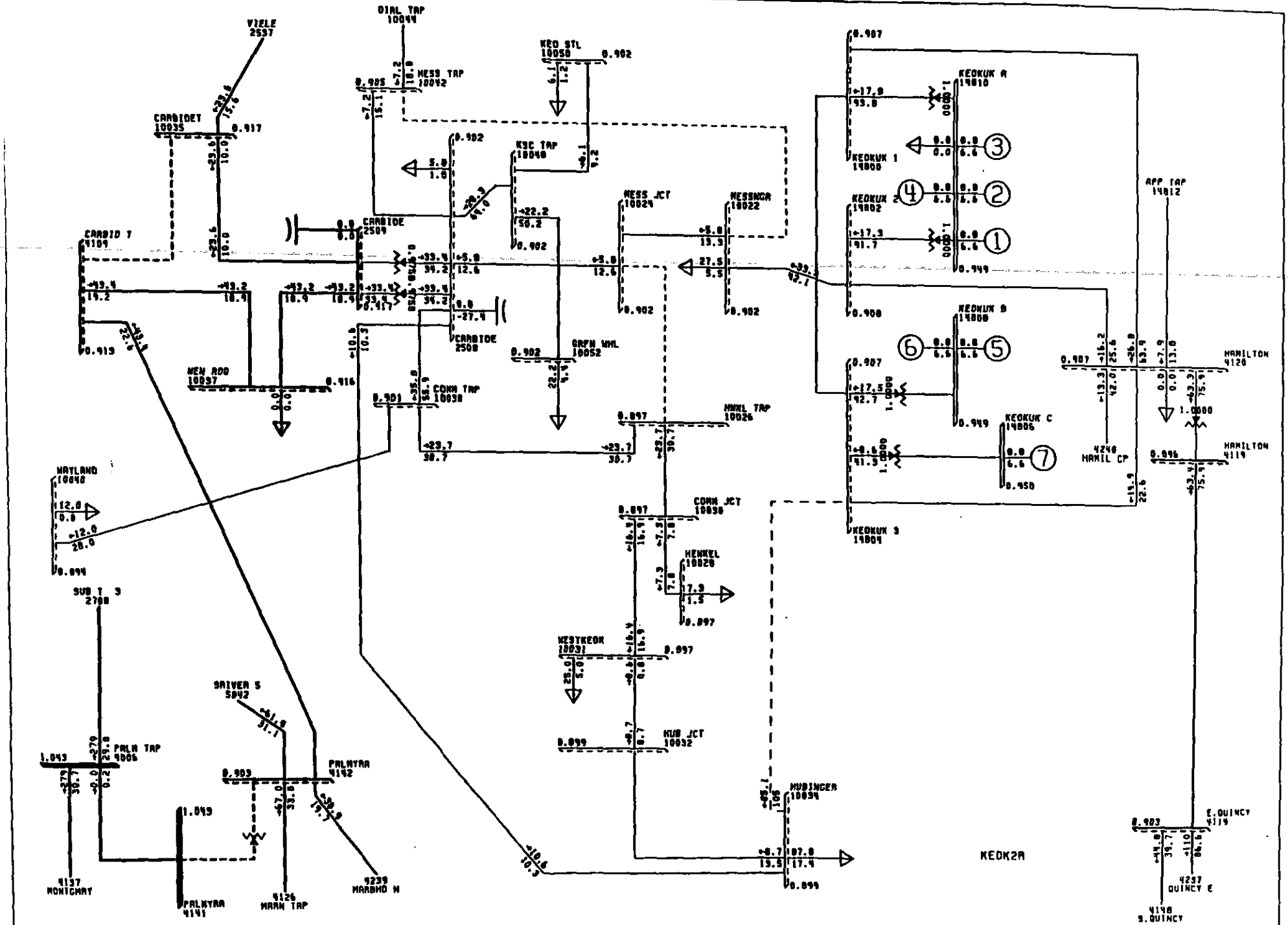
2006B 69KV PLAN
CONT 1: LOSS OF NEW HYDRO-ROQUETTE LINE

100% RATER
0.925UV 1.060OV

BUS - VOLTAGE(PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



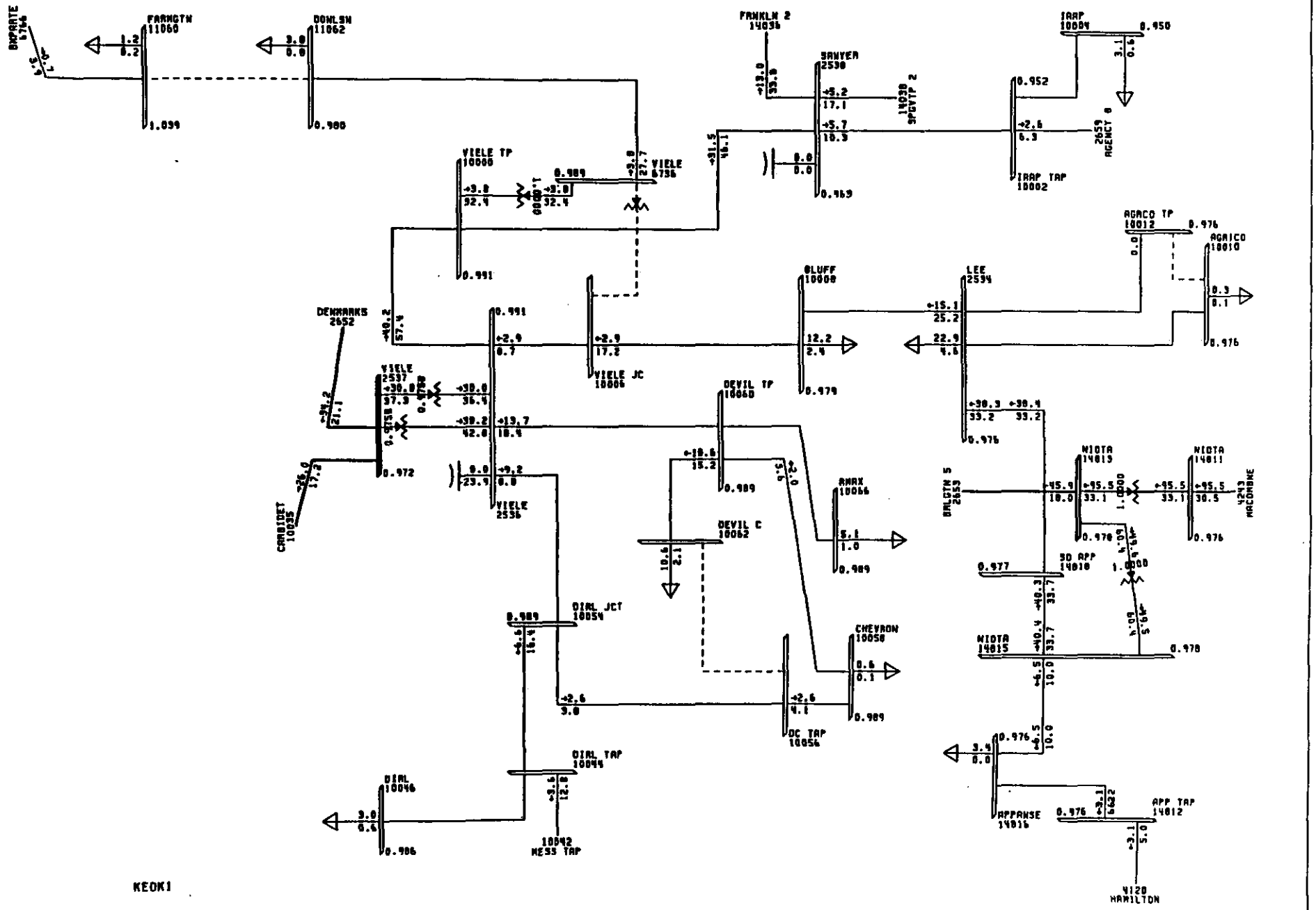
POWER TECHNOLOGIES, INC.	2006B 69KV PLAN CONT 2: LOSS OF PALMYRA 345/161 FRI, JUN 02 1995 16:07	100% RATEA 0.925 UV 1.060 OV KV: ≤72 , ≤141 , ≤167	BUS - VOLTAGE (PU) BRANCH - MW/% OF RATE A EQUIPMENT - MW/MVAR



2006B 69KV PLAN
2: LOSS OF PALMYRA 345/161

100% RATED
0.925 UV 1.060 OV
KV ≤1 67

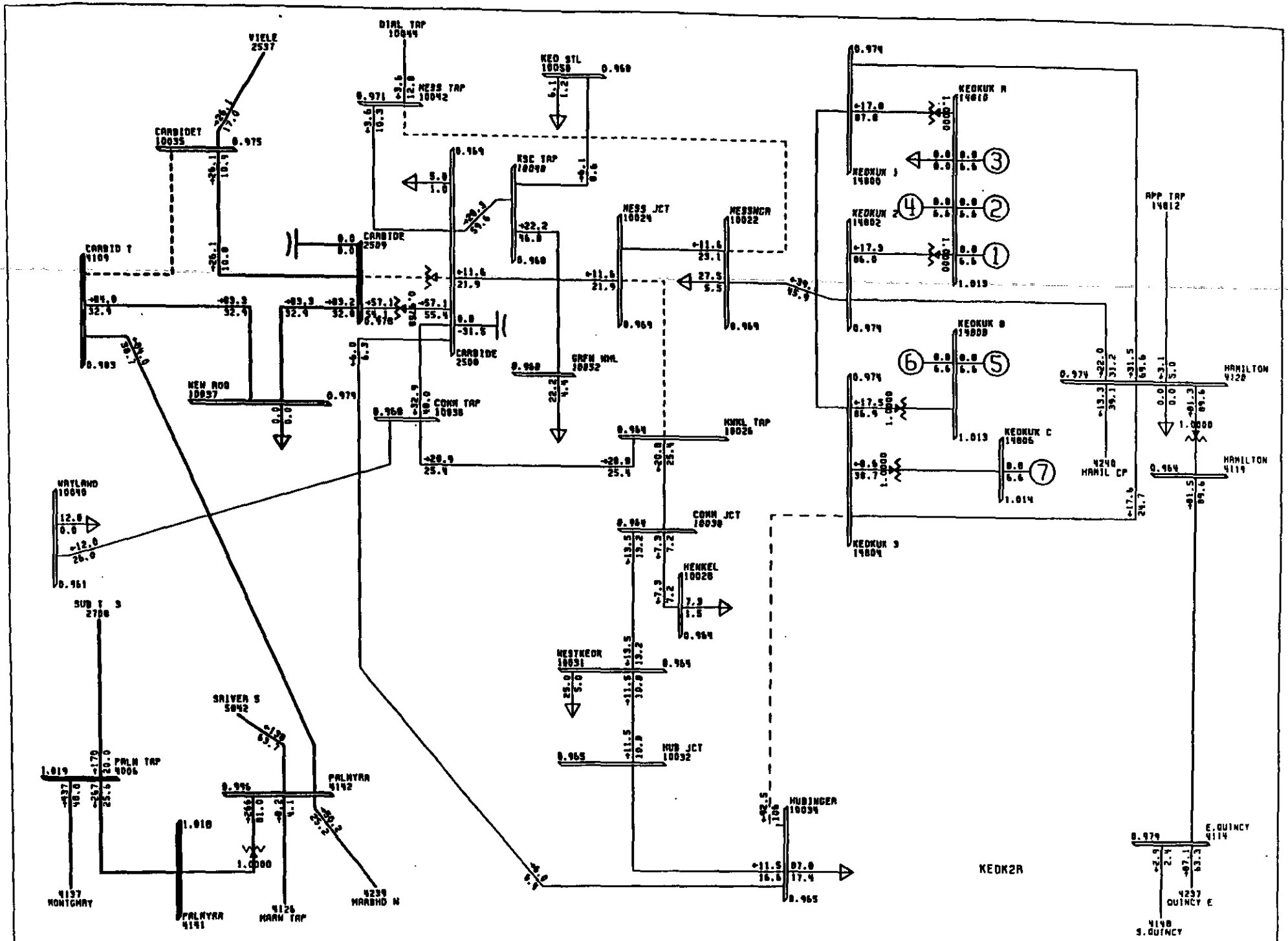
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



2006B 69KV PLAN
CONT 3: LOSS OF CARBIDE XFMR
FRI, JUN 02 1995 16:07

100% RATEA
0.925 UV 1.060 OV
KV: ≤72 , ≤141 , ≤167

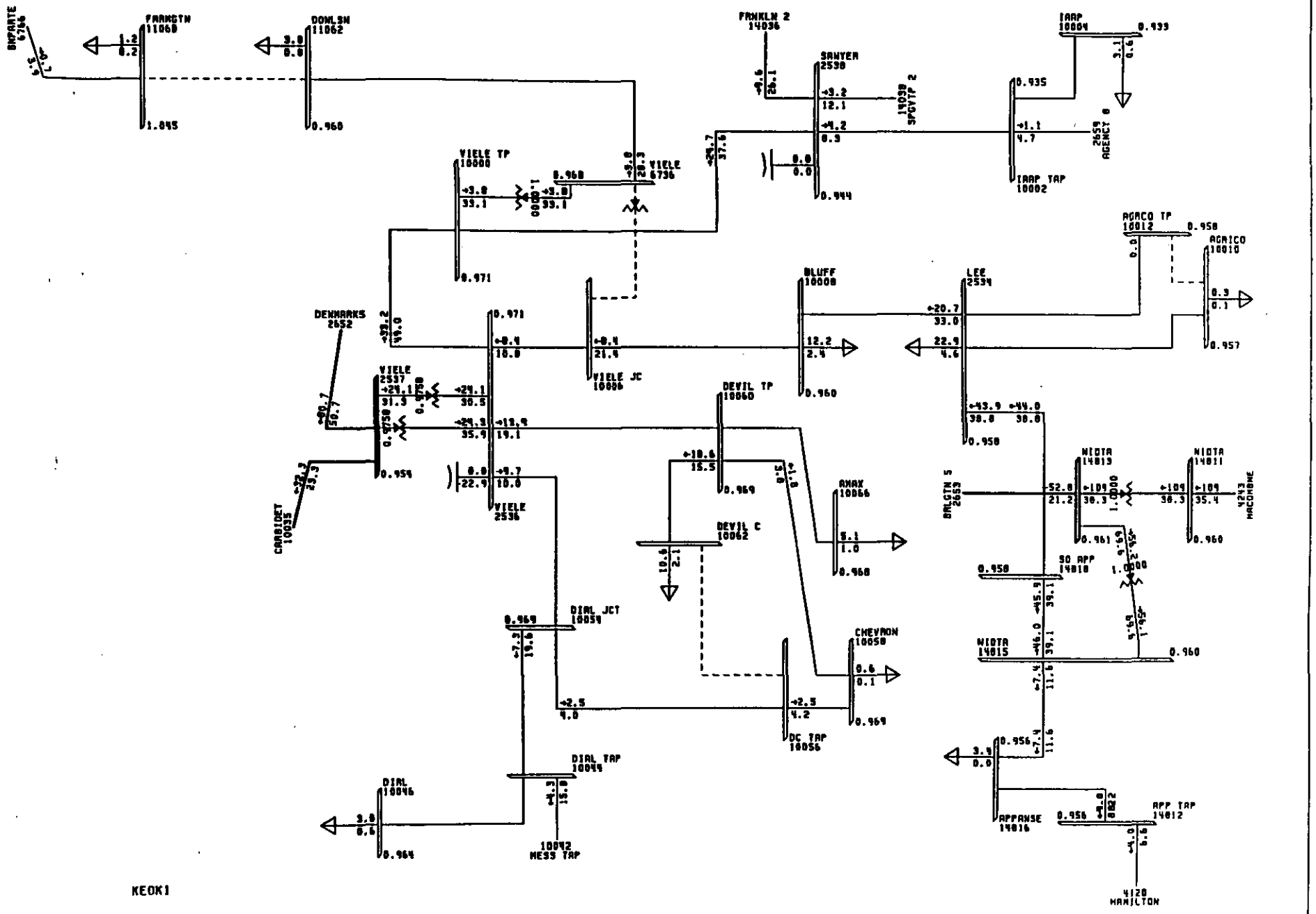
BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



2006B 69KV PLAN
CONT 3: LOSS OF CARBIDE XFMR

100% RATER
0.925UV 1.060OV

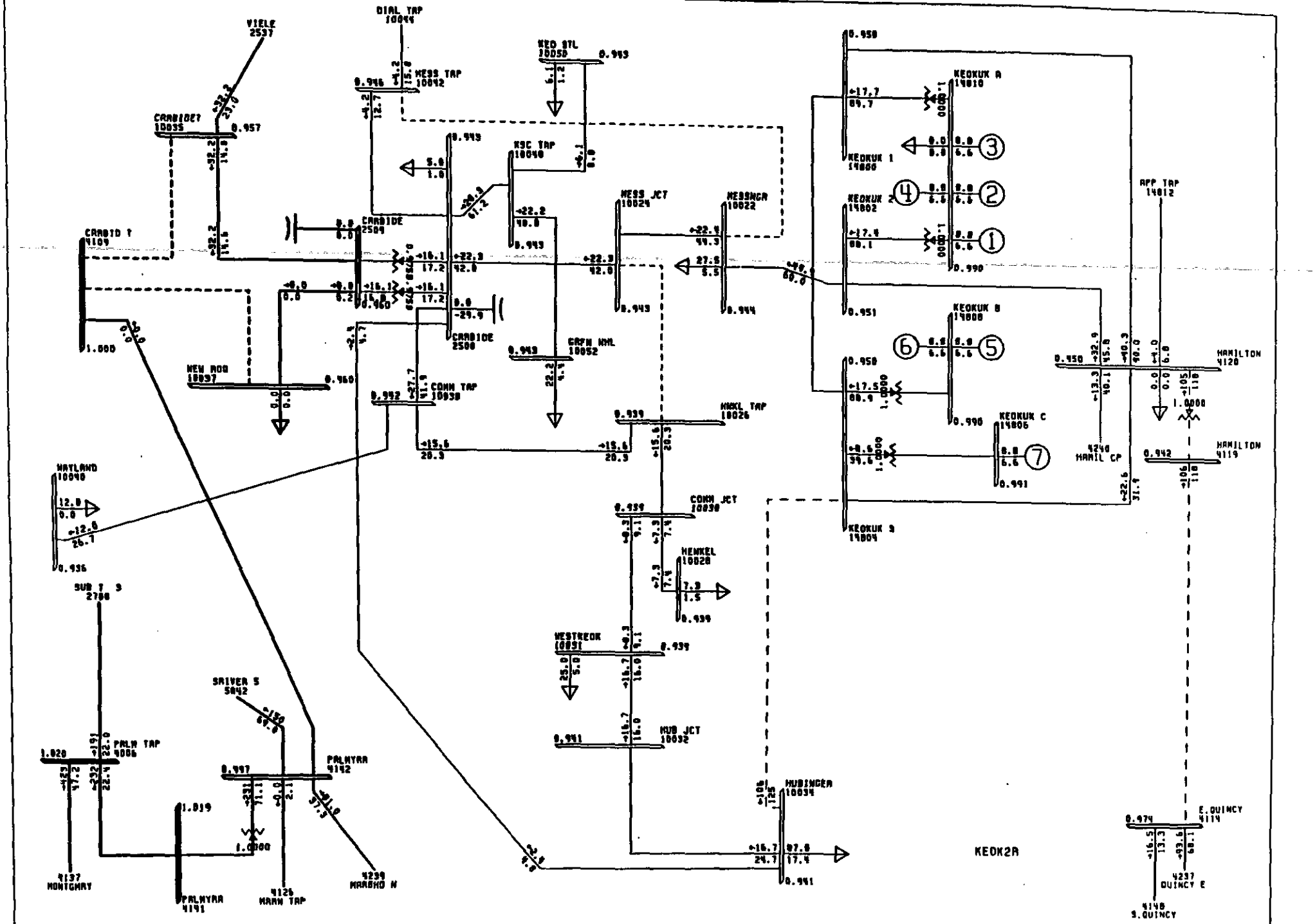
BUS - VOLTAGE(PU)
BRANCH - MW/% OF RATE A



2006B 69KV PLAN
CONT 4: LOSS OF CARBIDE T - NEW ROQUETTE
ERT JUN 02 1995 16:07

100% RATER
0.925UV 1.060OV
KV: ≤72 ,≤141 ,≤167

BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR



2006B 69KV PLAN

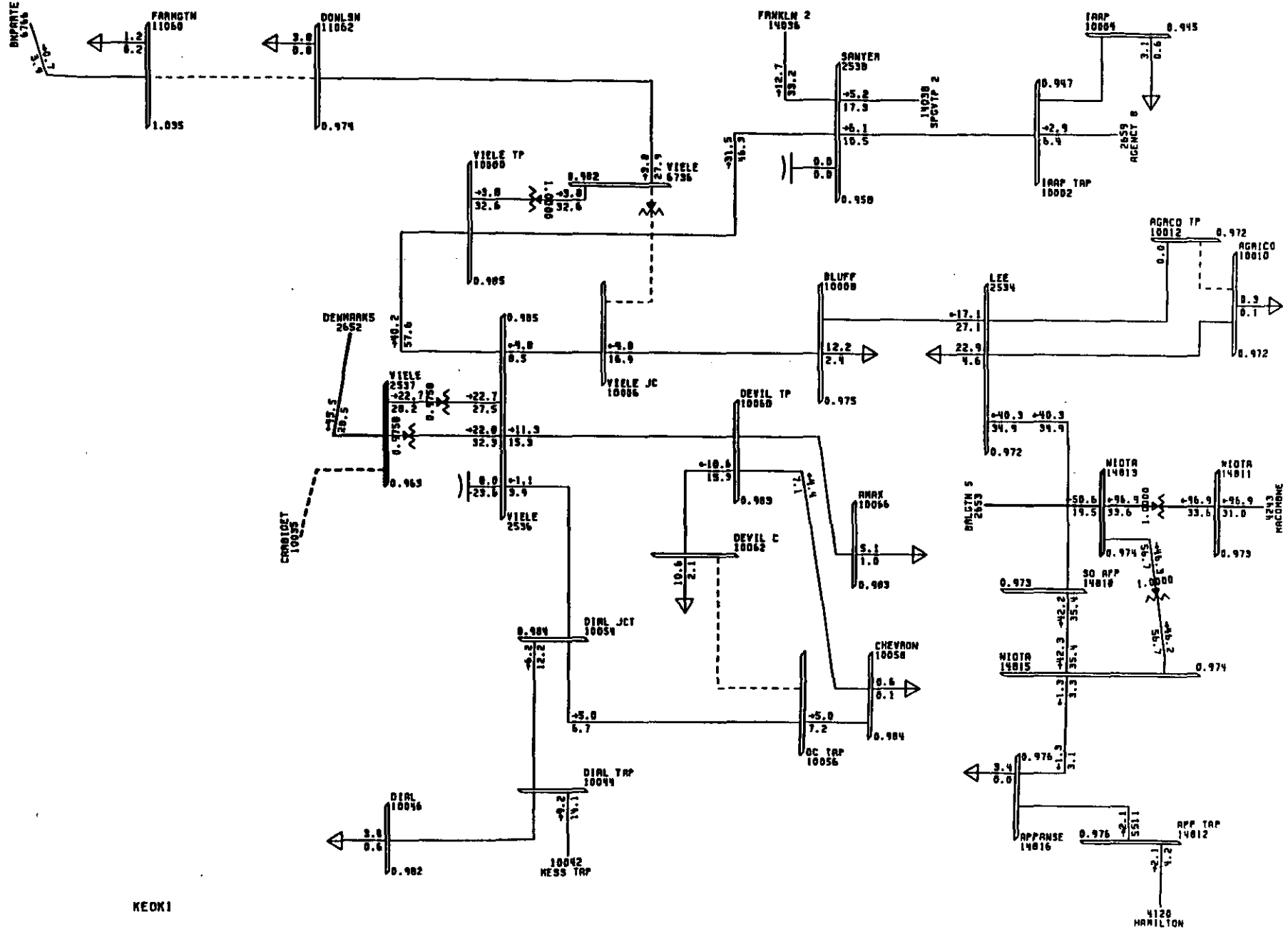
4- LOSS OF CARBIDE T - NEW ROQUETTE

100% RATER

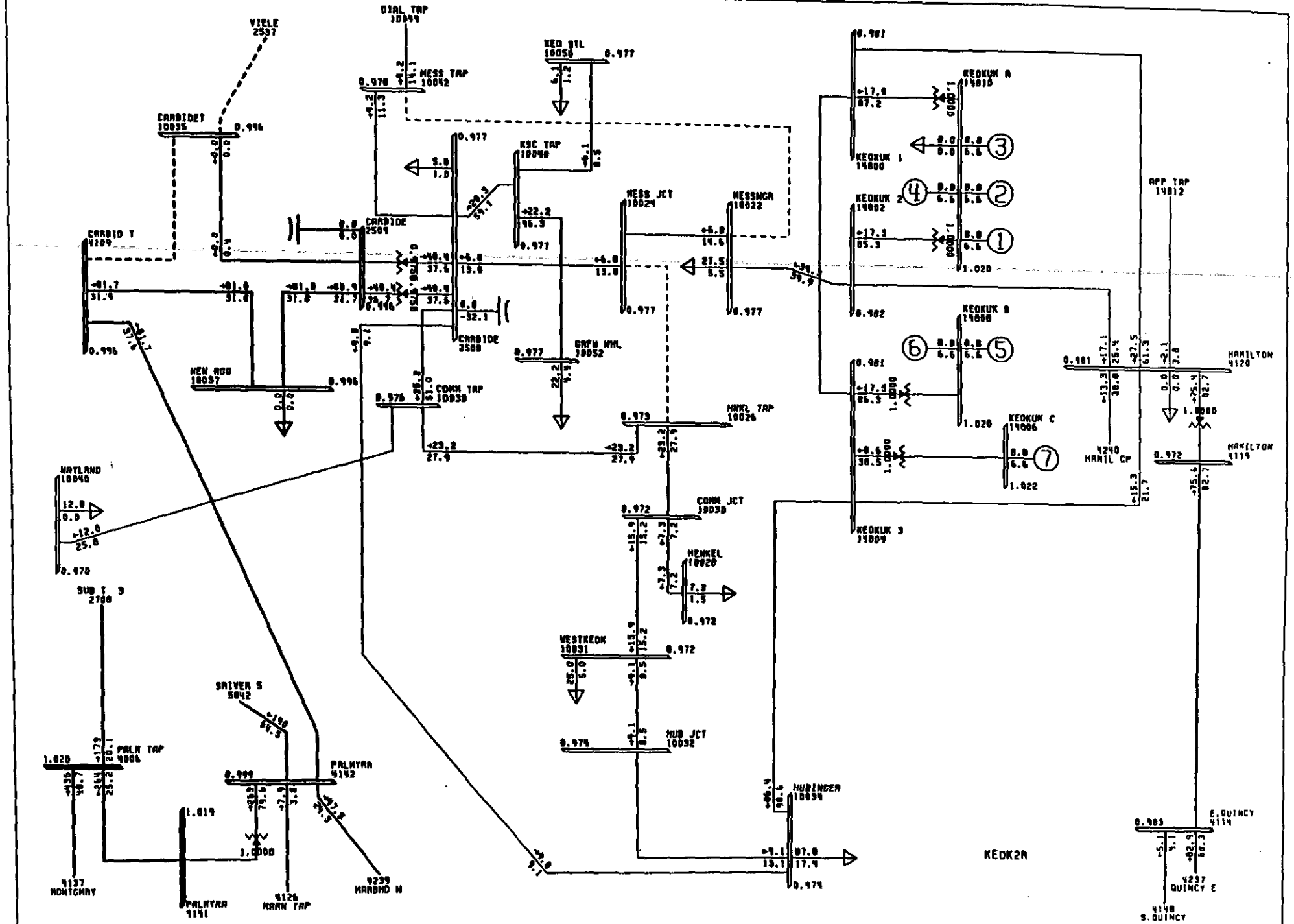
0.925UV 1.060OV

BUS - VOLTAGE(PU)

BRANCH - MW/% OF RATE A

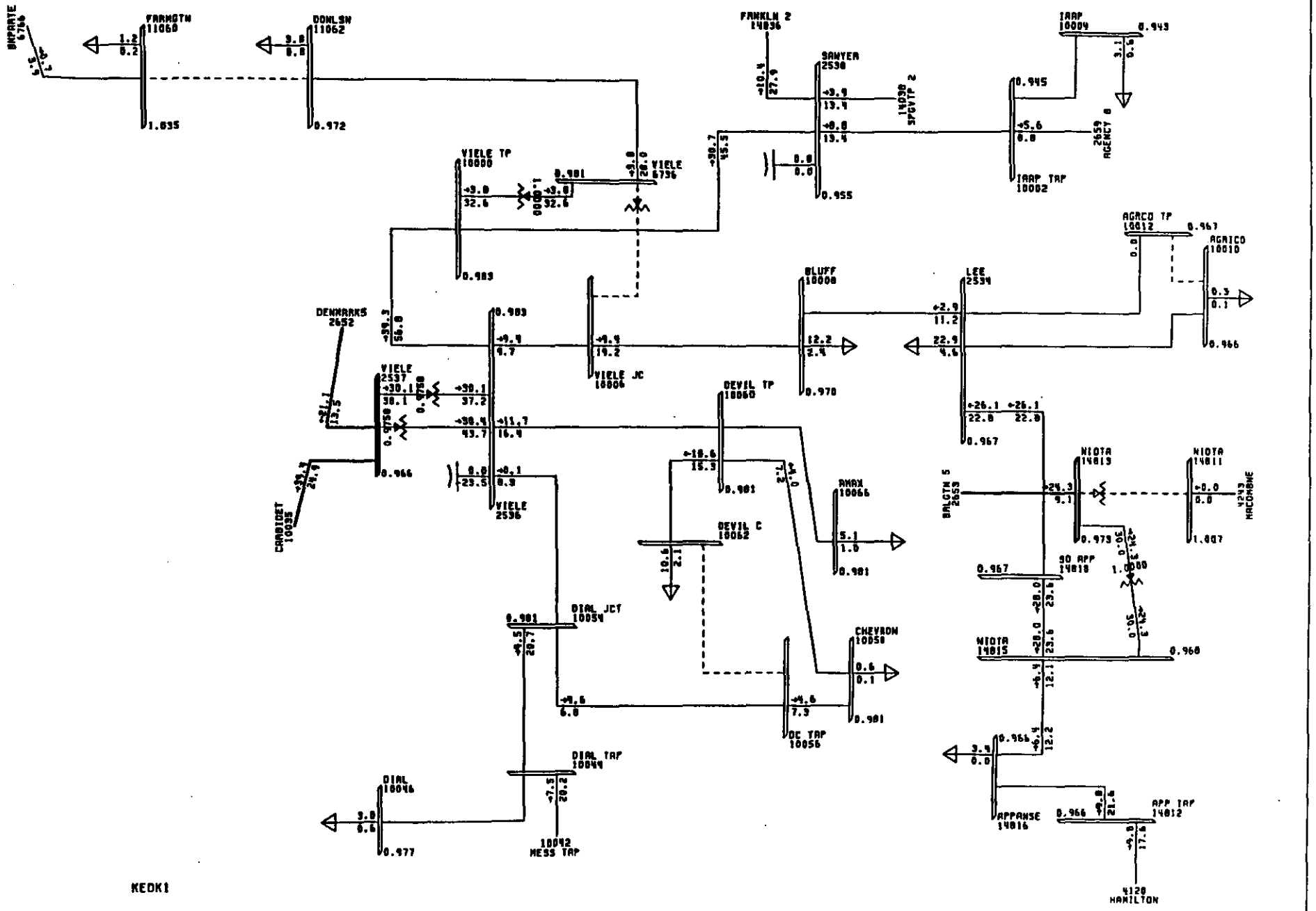


POWER TECHNOLOGIES, INC.	2006B 69KV PLAN CONT 5: LOSS OF CARBIDE - VIELE FRI, JUN 02 1995 16:07	100% RATEA 0.925 UV 1.060 OV KV: ≤72 , ≤141 , ≤167	BUS - VOLTAGE (PU) BRANCH - MW/% OF RATE A EQUIPMENT - MW/MVAR

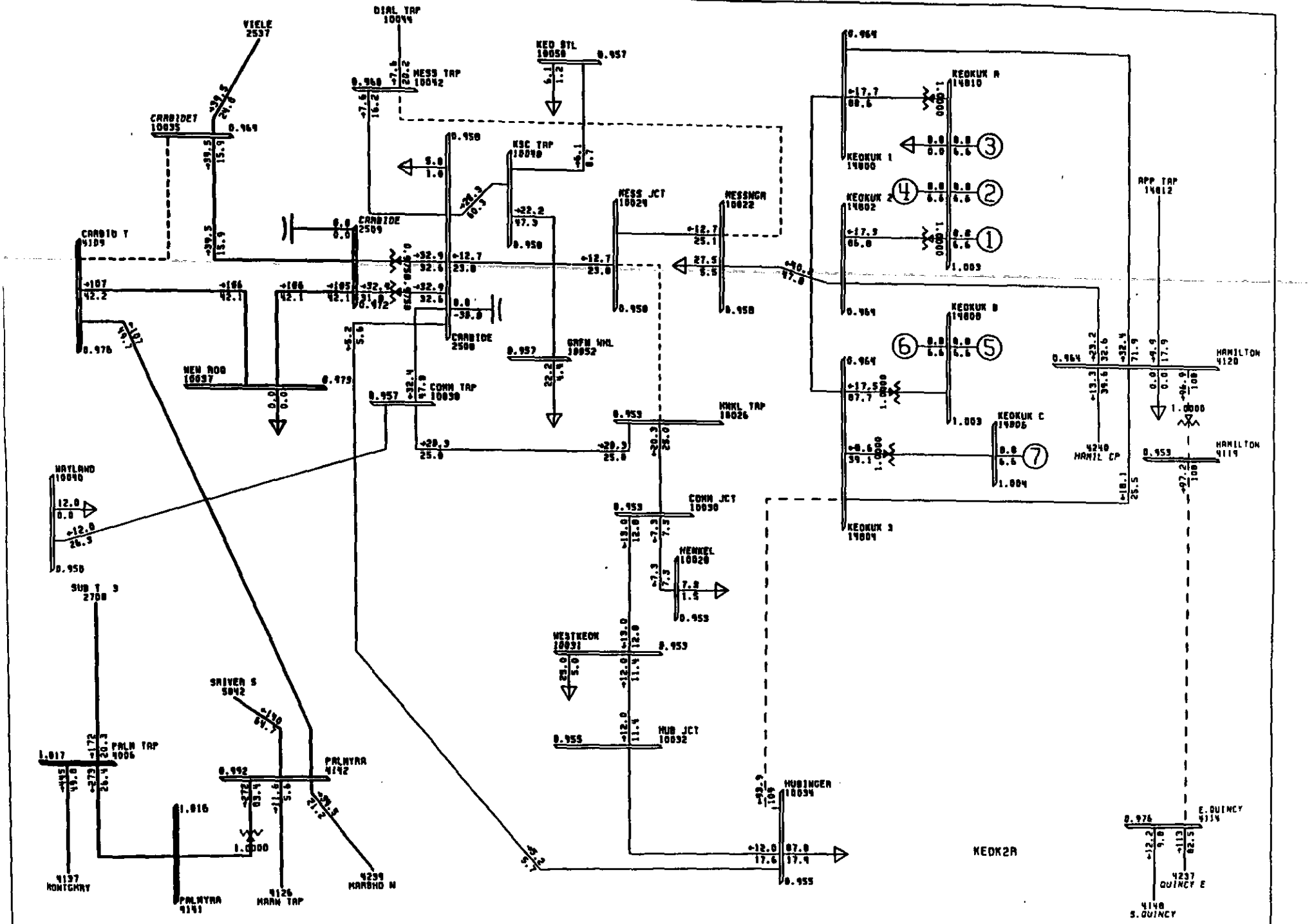


2006B 69KV PLAN

5: LOSS OF CARBIDE - VIELE



POWER TECHNOLOGIES, INC.	2006B 69KV PLAN CONT 6: LOSS OF NIOTA XFMR FRI, JUN 02 1995 16:07	100% RATEA 0.925UV 1.060 OV KV: ≤72 , ≤141 , ≤167	BUS - VOLTAGE (PU) BRANCH - MW/% OF RATE A EQUIPMENT - MW/MVAR



2006B 69KV PLAN
CONT 6: LOSS OF NIOTA XFMR

100% RATEA
0.925 UV 1.060 OV
KV: ≤72 ≤141 ≤167

BUS - VOLTAGE (PU)
BRANCH - MW/% OF RATE A
EQUIPMENT - MW/MVAR