ELECTRICAL PENETRATION PROTECTION CONTROL CIRCUITS

(PRIMARY AND SECONDARY)

NORTH ANNA POWER STATION - UNIT 2

VIRGINIA ELECTRIC AND POWER COMPANY

STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASSACHUSETTS

POSITION	PENETRATION TYPE	PENETRATION CONDUCTOR	LOAD	TIME-CURRENT CURVE 12050-SK(C)-	FULL LOAD AMPS	PRIMARY PROTECTIVE DEVICE	NOTES & COMMENTS	SECONDARY PROTECTIVE DEVICE	NOTES & COMMENTS
2F1-2	IC	10-AWG	Fuel Transfer Control Cab (2-EI-CB-92)	IC-1	3.9A	Fuse Bussman NON-15A		Fuse Bussman NON-15A*	
6F-2	IB	14-AWG	a) Stem Limit Switch (SLS MOV-2865A)	IB-1	178mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			b) Loop 1 Rad CKT	IB-2A	300mA	Fuse Bussman ABC 10A		Breaker GE TE-15A	
			c) Loop 1 x Conn (MOV-2585)	IB-3	178mA	Fuse Bussman NON-15A	See Note "A" below for all circuits with IB-3 time current curve.	Fuse Bussman NON-15A	
			d) Hot Leg Isol (MOV-2590)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			e) Cold Leg Isol (MOV-2591)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			f) St. Generator Surface Sample (TV-SS212A)	IB-4	447mA	Breaker GE TE 15A		Breaker GE TE-15A*	
			g) Acc TK 1 CD Lg (MOV-2865A)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			h) ACC TK 1 CD LG (MOV-2865A)	*IB-5	178mA	Fuse Bussman ABC 3A		Breaker GE TE-15A	
			i) ACC TK 2 CD LG (MOV-2865B)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			j) Acc TK 2 CD LG (MOV-2865B)	IB-5	178mA	Fuse Bussman ABC 3A		Breaker GE TE-15A	
			k) Loop 1 Regen Hx Outlet (HCV-2200A)	IB-5	20mA	Fuse Bussman ABC 3A		Breaker GE TE-15A	
			l) Loop 1 Regen Hx Outlet (HCV2200A)	IB-6	20mA	Breaker GE THED-15A		Breaker GE THED-15A*	
			m) Loop 1 Regen Hx Outlet (HCV-2200A)	IB-2E	20mA	Fuse Bussman ABC 10A		Breaker GE THED-15A	
			n) Loop 2 Regen Hx Outlet (HCV-2200B)	IB-5	20mA	Fuse Bussman ABC 3A		Breaker GE TE-15A	
			o) Loop 2 Regen Hx Outlet (HCV-2200B)	IB-6	20mA	Breaker GE THED-15A		Breaker GE THED-15A*	
			p) Loop 2 Regen Hx Outlet (HCV-2200B)	IB-2E	20mA	Fuse Bussman ABC 10A		Breaker GE THED-15A	
			q) Loop 3 Regen Hx Outlet (HCV-2200C)	IB-5	20mA	Fuse Bussman ABC 3A		Breaker GE TE-15A	
			r) Loop 3 Regen Hx Outlet (HCV-2200C)	IB-6	20mA	Breaker GE THED-15A		Breaker GE THED-15A*	
			s) Loop 3 Regen Hx Outlet (HCV-2200C)	IB-2E	20mA	Fuse Bussman ABC 10A		Breaker GE THED-15A	
			t) Press to Relief TK (PCV-2455C)	IB-6	54mA	Breaker GE THED-15A		Breaker GE THED-15A*	
			u) Loop 1 Recirc Air Coil (TV-CC205A)	IB-1	447mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			v) Containment Instr Air (TV-IA201A)	IB-1	447mA	Breaker GE TQB 5A		Breaker GE TE-15A	

*Proposed Secondary Protection Device. Existing Secondary Device inadequate.

Note A: Primary and secondary protection for all circuits with time current curve IB-3 provided by two Bussman Non 15A fuses, one in each leg of the 120 V a-c or 125 V d-c ungrounded circuit. See Sketch No. 1.

POSITION	PENETRATION TYPE	PENETRATION CONDUCTOR	LOAD	TIME-CURRENT CURVE 12050-SK(C)-	FULL LOAD AMPS	PRIMARY PROTECTIVE DEVICE	NOTES & COMMENTS	SECONDARY PROTECTIVE DEVICE	NOTES & COMMENTS
			w) (Rack 2-108)	IB-2A	380mA	Fuse Bussman ABC 10A		Breaker GE TE-15A	
			x) Press to Relief TK, (MOV-2536)	IB-3	140mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			y) Loop 1 HT LG CON (MOV-2700)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			z) Acc TK 3 Disch (MOV-2720A)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
6C-2	IB	14-AWG	a) Rack 2-120	IB-2A	380mA	Fuse Bussman ABC 10A		Breaker GE TE-15A	
			b) Loop 2 X Conn (MOV-2586)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			c) Loop 2 Rad CKT	IB-2A	300mA	Fuse Bussman ABC 10A		Breaker GE TE-15A	
			d) Hot Leg Isol (MOV-2592)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			e) Cold Leg Isol (MOV-2593)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			f) Recirc Spray (2-RS-P-01A via S-W)	IB-3	132mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A*	
			g) Air Operated Damper (HV257A)	IB-1	73mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			h) Air Operated Damper (HV257B)	N/R	N/R	Spare		Spare	
			i) Air Operated Damper (HV257C)	IB-1	73mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			j) Cont Vacuum Eject Inlt (TV-CV200)	IB-1	330mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			k) Loop 2 Recirc Air Coil (TV-CC205B)	IB-1	447mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			l) Loop 3 Recirc Air Coil (TV-CC205C)	IB-1	447mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			m) Press Liquid Space (TV-SS200A)	IB-1	447mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			n) Press Vapor Space (TV-SS201A)	IB-1	447mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			o) Press Liquid Space (TV-SS300A)	IB-1	447mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			p) Press Rel TK Gas Space (TV-SS204A)	IB-1	447mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			q) Prim Cool Hot Leg Hdr (TV-SS206A)	IB-1	447mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			r) RCP SWBK DIS (MOV-2590)	IB-3	174mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	

*Proposed Secondary Protection Device. Existing Secondary Device Inadequate.
See Note A on Page 1 for circuits with time current curve IB-3.

POSITION	PENETRATION TYPE	PENETRATION CONDUCTOR	LOAD	TIME-CURRENT CURVE 12050-SK(C)-	FULL LOAD AMPS	PRIMARY PROTECTIVE DEVICE	NOTES & COMMENTS	SECONDARY PROTECTIVE DEVICE	NOTES & COMMENTS
68-2	IB	14-AWG	a) Letdown Line Loop 2 (LCV-2460B Lim. Sw.)	IB-5	84mA	Bussmann ABC-3A		Breaker GE TE-15A	
			b) Loop 1 RCP Seal Lk Off (HCV-2303A)	IB-7	20mA	GE TEB-10A		Breaker GE TEB-10A*	
			c) Loop 2 RCP Seal Lk Off (HCV-2303B)	IB-7	20mA	GE TEB-10A		Breaker GE TEB-10A*	
			d) Loop 2 Accum Test Line (HCV-2850C)	IB-7	20mA	GE TEB-10A		Breaker GE TEB-10A*	
			e) Loop 2 Accum Test Line (HCV-2850D)	IB-7	20mA	GE TEB-10A		Breaker GE TEB-10A*	
			f) Loop 2 Accum Mk Up Line (HCV-2851B)	IB-7	20mA	GE TEB-10A		Breaker GE TEB-10A*	
			g) Loop 2 Accum Prim XFER (HCV-2852B)	IB-7	20mA	GE TEB-10A		Breaker GE TEB-10A*	
			h) Loop 2 Accum N2 Supply (HCV-2853B)	IB-7	20mA	GE TEB-10A		Breaker GE TEB-10A*	
			i) Loop 2 Stand Pipe Trip (TV-2522B)	IB-7	46mA	GE TEB-10A		Breaker GE TEB-10A*	
			j) Pri Grd Wtr to Rel TK (HCV-2515)	IB-7	20mA	GE TEB-10A		Breaker GE TEB-10A*	
			k) Auxiliary Spray Line (HCV-2311)	IB-7	20mA	GE TEB-10A		Breaker GE TEB-10A*	
			l) PR Rel TK to PO XFER TK (TV-2523)	IB-7	46mA	GE TEB-10A		Breaker GE TEB-10A*	
			m) Loop 1 Letdown Line (LCV-2460A)	IB-7	84mA	GE TEB-10A		Breaker GE TEB-10A*	
			n) Loop 2 Drain Line (HCV-2557B)	IB-7	20mA	GE TEB-10A		Breaker GE TEB-10A*	
			o) Loop 2 PIL Line Header (HCV-2556B)	IB-7	20mA	GE TEB-10A		Breaker GE TEB-10A*	
			p) Letdown Line Loop 2 (LCV-2460B)	IB-7	84mA	GE TEB-10A*		Breaker GE TEB-10A*	

*Proposed Secondary Protection Device. Existing Secondary Device inadequate.

POSITION	PENETRATION TYPE	PENETRATION CONDUCTOR	LOAD	TIME-CURRENT CURVE 120%-SK(C)-	FULL LOAD AMPS	PRIMARY PROTECTIVE DEVICE	NOTES & COMMENTS	SECONDARY PROTECTIVE DEVICE	NOTES & COMMENTS
6D-2	IB	14-AWG	a) Loop 3 X Conn (MOV-2587)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			b) Loop 3 Red CKT	IB-3A	300mA	Fuse Bussman ABC 10A		Breaker GE TE-15A	
			c) Hot Leg Isol (MOV-2594)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			d) Cold Leg Isol (MOV-2595)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			e) Loop 2 Charging Line (HCV-2310)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			f) Neut Shld TK Cool A Inlt (TV-CC207A)	IB-1	330mA	Breaker GE TQB-5A		Breaker GE TE-15A	
			g) Neut Shld TK Cool A Otlet (TV-CC208A)	IB-1	330mA	Breaker GE TQB- 5A		Breaker GE TE-15A	
			h) Neut Shld TK Cool B Inlt (TV-CC207B)	IB-1	330mA	Breaker GE TQB- 5A		Breaker GE TE-15A	
			i) Skid Comp A (2-IA-C-02A)	IB-3	935mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			j) Neut Shld TK Cool B Otlt (TV-CC208B)	IB-1	330mA	Breaker GE TQB-5A		Breaker GE TE-15A	
			k) Press Rel TK N2 Purge (HCV-2590)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			l) Loop 2 Inlet Header (TV-CC206B)	IB-1	330mA	Breaker GE TQB-5A		Breaker GE TE-15A	
			m) RCP Bearing Lift Fp (PS-13-2)	IB-3	30mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			n) RCP Bearing Lift Fp (PS-13-2)	IB-3	6.7A for 4.5 Cycles	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			o) RCP Bearing Lift Fp (PS-14-2)	IB-3	6.7A for 4.5 Cycles	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			p) RACK 2-102	IB-2A	330mA	Fuse Bussman ABC 10A		Breaker GE TE-15A	
			q) Neutron Shld Cool Make Up (SOV-NS-201)	IB-1	330mA	Breaker GE TQB-5A		Breaker GE TE-15A	
			aa) Nuclear Inst Evacuation (2-ND-EH-01)	IB-5	Later	Bussman ABC 3A		Breaker GE TE-15A	
			ab) Skid Comp A (PS-IA213A)	-	-	Internal Annunciator Circuit**			
11A-2	IC	10-AWG	a) Steam Gen Blow Down (TV-BD200G)	IC-2	447mA	Breaker GE TQB-5A		Breaker GE TE-15A	
			b) Steam Gen Blow Down (TV-BD200H)	IC-2	447mA	Breaker GE TQB-5A		Breaker GE TE-15A	
			c) Steam Gen Blow Down (TV-BD200J)	IC-2	447mA	Breaker GE TQB-5A		Breaker GE TE-15A	
11C-2	IC	10-AWG	a) Loop 1 SLS CKTS	IC-3	330mA	Fuse Bussman ABC 10A		Breaker GE TE-15A	
			b) RACK 2-106	IC-3	330mA	Fuse Bussman ABC 10A		Breaker GE TE-15A	

*Proposed Secondary Protection Device. Existing Secondary Device Inadequate.
**Current limiting to 4 amps.
See Note A on Page 1 for circuits with time current curve IB-3.

POSITION	PENETRATION TYPE	PENETRATION CONDUCTOR	LOAD	TIME-CURRENT CURVE 12050-SK(C)-	FULL LOAD AMPS	PRIMARY PROTECTIVE DEVICE	NOTES & COMMENTS	SECONDARY PROTECTIVE DEVICE	NOTES & COMMENTS
11D-2	IC	10-AWG	a) Loop 2 SLS CKTS	IC-3	300mA	Fuse Bussman ABC 10A		Breaker GE TE-15A	
			b) RACK 2-117	IC-3	380mA	Fuse Bussman ABC 10A		Breaker GE TE-15A	
			c) Press Relief N2 Supply (SOV-2455C-3)	IC-4	1.6A	Breaker GE TEB-10A		Breaker GE TEB-10A*	
11E-2	IC	10-AWG	a) Loop 3 SLS CKTS	IC-3	300mA	Fuse Bussman ABC 10A		Breaker GE TE-15A	
			b) RACK 2-103	IC-3	380mA	Fuse Bussman ABC 10A		Breaker GE TE-15A	
14E-2	IB	14-AWG	a) Reaid Heat Rem Hdr A (TV-SS207A, 207B)	IB-4	330mA	Breaker GE TE-15A		Breaker GE TE-15A*	
			b) Reaid Heat Rem Hdr B (TV-SS207B)	IB-4	330mA	Breaker GE TE-15A		Breaker GE TE-15A*	
			c) Loop 1,2&3 S/G Sample Selector (TV-SS211A-C)	IB-4	330mA	Breaker GE TE-15A		Breaker GE TE-15A*	
			d) Reactor Leak DET Line (HCV-2544)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			e) Loop 1 Inlet Header (TV-CC206A)	IB-1	330mA	Breaker GE TQB-5A		Breaker TE-15A	
			f) Loop 3 Inlet Header (TV-CC206C)	IB-1	330mA	Breaker GE TQB-5A		Breaker TE-15A	
			g) RCP Bearing Lift Pp (PS-12-2)	IB-3	30mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			h) RHR Return (MOV-CC200A)	IB-3	174mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			i) RHR Return (MOV-CC200B)	IB-3	174mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
19A-2	IB	14-AWG	a) Loop 1,2&3 Prim Cool CLD LG TE-SS209A-C	IB-4	330mA	Breaker GE TE-15A		Breaker GE TE-15A*	
			b) Loop 3 Drain Cont V (HCV-2557C)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			c) Loop 1 Accum Test Line (HCV-2850A)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			d) Loop 1 Accum Test Line (HCV-2850B)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			e) Loop 3 Accum Test Line (HCV-2850E)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			f) Loop 3 Accum Test Line (HCV-2850F)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			g) Loop 1 Accum Mkup Line (HCV-2851A)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			h) Loop 3 Accum Mkup Line (HCV-2851C)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			i) Loop 1 Accum Prim XFER (HCV-2852A)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			j) Loop 3 Accum Prim XFER (HCV-2852C)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	

*Proposed Secondary Protection Device. Existing Secondary Device Inadequate.
See Note A on Page 1 for circuits with time current curve IB-3.

POSITION	PENETRATION TYPE	PENETRATION CONDUCTOR	LOAD	TIME-CURRENT CURVE 12050-8K(C)-	FULL LOAD AMPS	PRIMARY PROTECTIVE DEVICE	NOTES & COMMENTS	SECONDARY PROTECTIVE DEVICE	NOTES & COMMENTS
			k) Loop 1 Accum N2 Supply (HCV-2853A)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			l) Loop 3 Accum N2 Supply (HCV-2853C)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			m) Exc Letdown Hx Inlet (HCV-2201)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			n) Press Rel Tk N2 Line (HCV-2895)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			o) Reactor Coolant PP (SOV-CC216A)	IB-8	597mA	Breaker W Quik Lag 5A		Breaker GE TE-15A	
			p) Reactor Coolant PP (SOV-CC216B)	IB-8	597mA	Breaker W Quik Lag 5A		Breaker GE TE-15A	
			q) Reactor Coolant PP (SOV-CC216C)	IB-8	597mA	Breaker W Quik Lag 5A		Breaker GE TE-15A	
			r) Rel Tank V&D STS Line (HCV-2549)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			s) Excs Letdown Hx Outlet (HCV-2389)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			t) RCP Bearing Lift Pp (PS-14-2)	IB-3	3[illegible]mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			u) Primary Drain Transfer Tk (LS-DG203)	IB-3	123mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			v) Primary Drain Transfer Tk (LS-DG203)	IB-3	123mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			w) RC Purge System Supply (MOV-HV200A)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			x) RC Purge System Exh (MOV-HV200C)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			y) Cont Cab RAD near 2-RC-P-1A (2-FP-CP-06)	IB-6	5mA	Breaker GE THED-15A		Breaker GE THED-15A*	
			z) Cont Cab RAD near 2-RC-P-1B (2-FP-CP-07)	IB-6	5mA	Breaker GE THED-15A		Breaker GE THED-15A*	
			aa) Cont Cab RAD near 2-RC-P-1C (2-FP-CP-08)	IB-6	5mA	Breaker GE THED-15A		Breaker GE THED-15A*	
190-2	IB	14-AWG	a) ACC TK 3 GD LG (MOV-2865C)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			b) ACC TK 3 GD LG (MOV-2865C)	IB-5	178mA	Fuse Bussman ABC 3A		Fuse Bussman ABC 3A*	
			c) Recirc Spray (2-RS-P-01B VIB SW)	IB-3	132mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			d) Press To Relief TK (PCV-2456)	IB-6	54mA	Breaker GE THED-15A		Breaker GE THED-15A*	

*Proposed Secondary Protection Device. Existing Secondary Device inadequate.
See Note A on Page 1 for circuits with time current curve IB-3.

POSITION	PENETRATION TYPE	PENETRATION CONDUCTOR	LOAD	TIME-CURRENT CURVE 12050-SK(C)-	FULL LOAD AMPS	PRIMARY PROTECTIVE DEVICE	NOTES & COMMENTS	SECONDARY PROTECTIVE DEVICE	NOTES & COMMENTS
			e) Elevator	IB-9	Later	Fuse Bussman Type AGC-6A		Fuse Bussman Type AGC-6A*	
			f) Elevator	IB-9	Later	Fuse Bussman Type AGC-6A		Fuse Bussman Type AGC-6A*	
			g) Air Operated Damper (HV257B)	IB-1	73mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			h) Air Operated Damper (HV257C)	IB-1	73mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			i) RCP Thermal Barrier (TV-CC201B)	IB-1	447mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			j) Loop 1 Return Header (TV-CC202B)	IB-1	447mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			k) Loop 2 Return Header (TV-CC202D)	IB-1	447mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			l) Loop 3 Return Header (TV-CC202F)	IB-1	447mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			m) Reac Cont Sump Pp Disch (TV-DA200B)	IB-1	447mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			n) Prim Drain XFER LP Dis (TV-DG200B)	IB-1	447mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			o) Limit SW ON TV-HM200C (TV-HM200C)	IB-1	447mA	Breaker GE TQB 5A		Breaker GE TE-15A	
			p) Skid Comp B (2-IA-C-02B)	IB-3	935mA	Fuse Bussman NON 15A		Fuse Bussman NON-15A	
			q) Containment Isol (TV-2842)	IB-6	158mA	Breaker GE THED-15A		Breaker GE THED-15A*	
			r) Pri Drn XFER TK Vent (TV-VG200B)	IB-1	447mA	Breaker GE TQB-5A		Breaker GE TE-15A	
			s) N2 Supply Line (HCV-2935)	IB-6	20mA	Breaker GE THED-15A		Breaker GE THED-15A*	
			t) Press to Rel TK (MOV-2535)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			u) LP 1 HT LG CON (MOV-2701)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			v) ACC TK 3 DISCH (MOV-2720B)	IB-3	178mA	Fuse Bussman NON-15A		Fuse Bussman NON-15A	
			w) Skid Comp B (Pt.-IA213B)	-	-	Internal Annunciator Circuit**			
19D-2	IB	14-AWG	a) Primary Coolant Hot Leg (TV-SS209A-D)	IB-4	330mA	Breaker GE TE-15A		Breaker GE TE-15A*	
			b) Primary Coolant Hot Leg (TV-SS209A-D)	IB-4	330mA	Breaker GE TE-15A		Breaker GE TE-15A*	
			c) Loop 1 Letdown Line (LCV-2460A Lim. Sw.)	IB-2A	84mA	Bussmann ABC-3A		Breaker GE TE-15A	
			d) Incore Instr RM Sump (LS-IA206)	IB-10	8mA	Breaker GE TQB-15A		Breaker GE TQB-15A*	

*Proposed Secondary Protection Device. Existing Secondary Device inadequate.
**Current limiting to 4 amps.
See Note A on Page 1 for circuits with time current curve IB-3.

POSITION	PENETRATION TYPE	PENETRATION CONDUCTOR	LOAD	TIME-CURRENT CURVE 12050-SK(C)-	FULL LOAD AMPS	PRIMARY PROTECTIVE DEVICE	NOTES & COMMENTS	SECONDARY PROTECTIVE DEVICE	NOTES & COMMENTS
			e) Loop 1 Stand Pipe Trip (TV-2522A)	IB-7	46mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			f) Loop 3 Stand Pipe Trip (TV-2522C)	IB-7	46mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			g) Loop 3 RCP Seal LK-OFF (HCV-2303C)	IB-7	46mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			h) Recirc Seal Wtr Outlet (HCV-2307)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			i) Loop 1 Fil Line Header (HCV-2556A)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			j) Loop 3 Fil Line Header (HCV-2556C)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			k) Loop 1 Drain Line (HCV-2557A)	IB-7	20mA	Breaker GE TEB-10A		Breaker GE TEB-10A*	
			l) Elevator	IB-9	Later	Fuse Bussman Type AGC 6A		Fuse Bussman Type AGC 6A*	
			m) Elevator	IB-9	Later	Fuse Bussman Type AGC 6A		Fuse Bussman Type AGC 6A*	
			n) Elevator	IB-9	Later	Fuse Bussman Type AGC 6A		Fuse Bussman Type AGC 6A*	
			o) Elevator	IB-9	Later	Fuse Bussman Type AGC 6A		Fuse Bussman Type AGC 6A*	
			p) Elevator	IB-9	Later	Fuse Bussman Type AGC 6A		Fuse Bussman Type AGC 6A*	
			q) Elevator	IB-9	Later	Fuse Bussman Type AGC 6A		Fuse Bussman Type AGC 6A*	
			r) Elevator	IB-9	Later	Fuse Bussman Type AGC 6A		Fuse Bussman Type AGC 6A*	
			s) Elevator	IB-9	Later	Fuse Bussman Type AGC 6A		Fuse Bussman Type AGC 6A*	
			t) RCP Bearing Lift Pp (PS-12-2)	IB-3	6.7A for 4.5 Cycles	Fuse Bussman NON 15		Fuse Bussman NON 15A	
21B-2	IC	10-AWG	a) Steam Gen Blowdown (TV-BD200B)	IC-2	447mA	Breaker GE TQB-5A		Breaker GE TE-15A	
			b) Steam Gen Blowdown (TV-BD200D)	IC-2	447mA	Breaker GE TQB-5A		Breaker GE TE-15A	
			c) Steam Gen Blowdown (TV-BD200F)	IC-2	447mA	Breaker GE TQB-5A		Breaker GE TE-15A	
			d) RC Purge Sys Supply (MOV-HV2008)	N/R	N/R	Spare		Spare	
			e) Mot Oper VV For Contain Supply (MOV-HV2006, MOV-HV2007)	IB-3	170mA	Fuse Bussman NON 15A		Fuse Bussman NON 15A	
21D-2	IC	10-AWG	a) Press Rel N2 Supply (SOV-2456-3)	IC-4	1.6A	Breaker GE TEB-10A		Breaker GE TEB-10A*	

*Proposed Secondary Protection Device. Existing Secondary Device inadequate.
See Note A on Page 1 for circuits with time current curve IB-3.

STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION SHEET

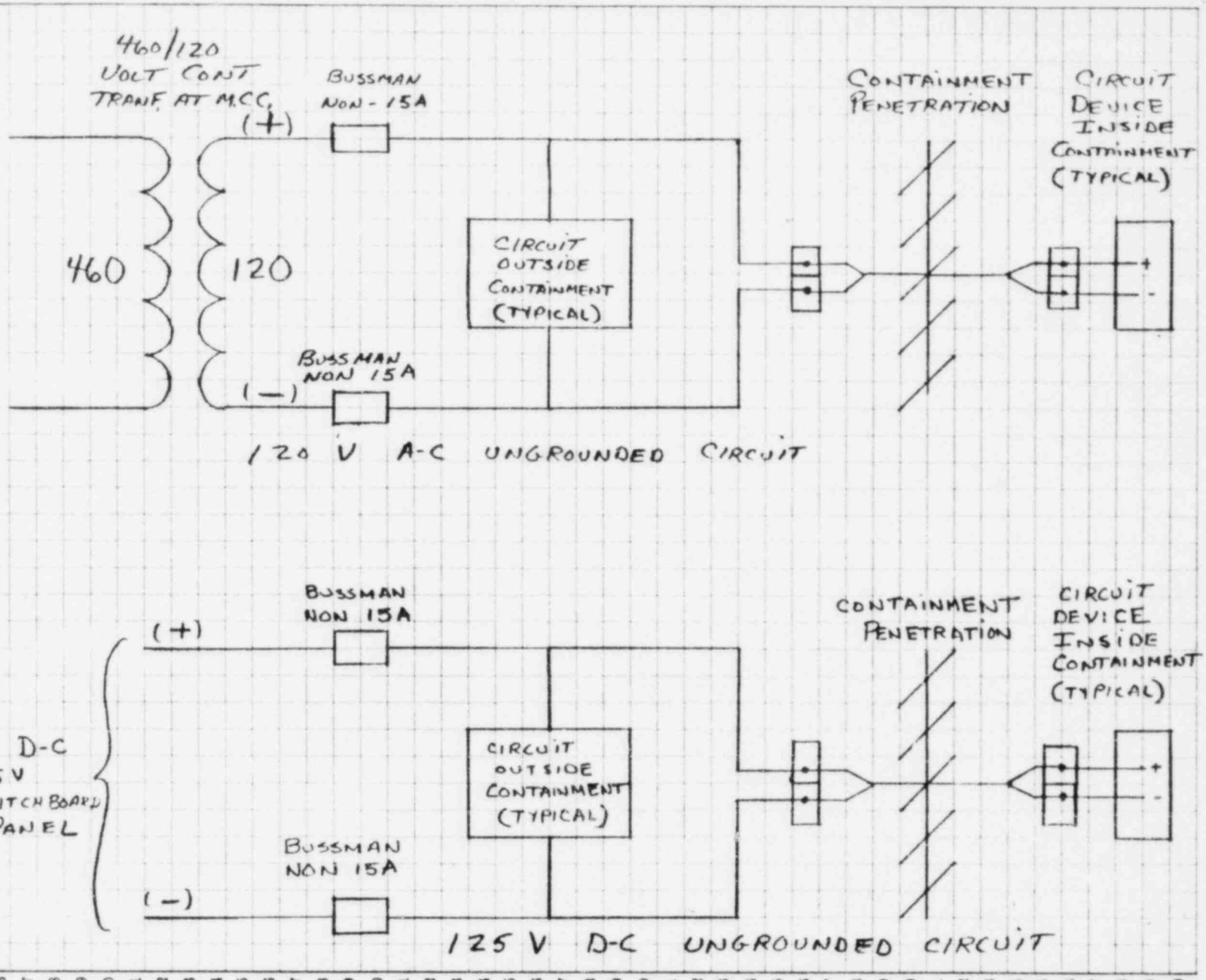
Page No. Preliminary Item

Client UEPCO Location Est. No. J.O. No. 12050

Subject TYPICAL ARRANGEMENT 120 V A.C. Date 9-26-80 By TPC

AND 125 V D.C UNGROUNDED CIRCUITS Checked 9-26-80 By TPC

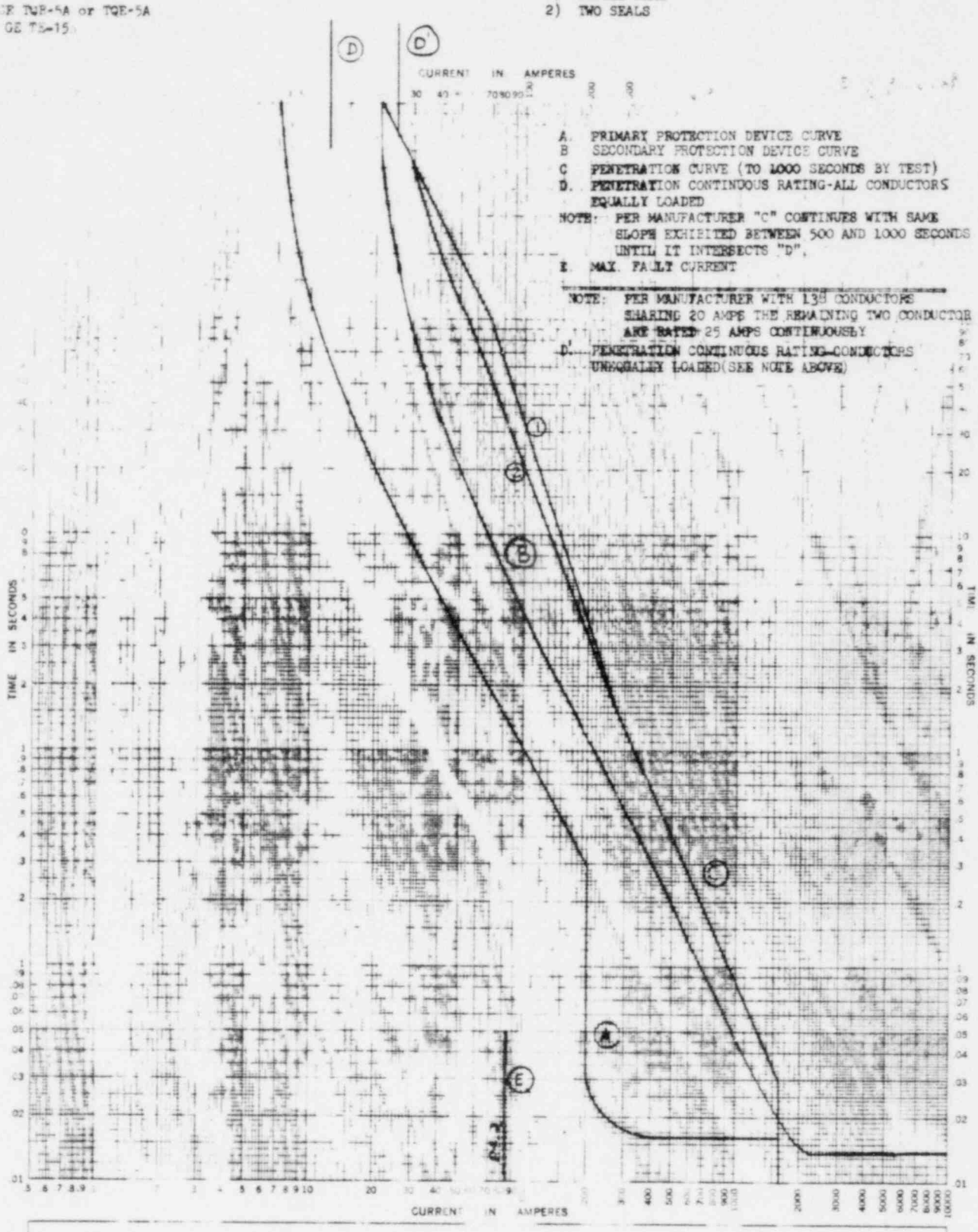
Based on Revised By



SKETCH NO. 1

A. GE TQB-5A or TQE-5A
B. GE TB-15

#14 FEED THRU
1) SINGLE SEAL
2) TWO SEALS



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links in _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p.f. starting at 25C with no initial load

2. Curves are plotted to _____ Test points so variations should be

No. 12050-SK(C)-IB-1

Date 2/19/80 MPC

K-E TIME-CURRENT CHARACTER... KEUFFEL & ESSER CO. ... 46 5258

FEU 1 7/15/2 TPC

A BUSSMAN ABC-10A
D. G. T.-151

#14 FEED THRU
1) SINGLE SEAL
2) TWO SEALS

AMPERES

A. PRIMARY PROTECTION DEVICE CURVE
B. SECONDARY PROTECTION DEVICE CURVE
C. PENETRATION CURVE (TO 1000 SECONDS BY TEST)
D. PENETRATION CONTINUOUS RATING - ALL CONDUCTORS EQUALLY LOADED
NOTE: PER MANUFACTURER "C" CONTINUES WITH SAME SLOPE EXHIBITED BETWEEN 500 AND 1000 SECONDS UNTIL IT INTERSECTS "D".
E. MAX. FAULT CURRENT

NOTE: PER MANUFACTURER WITH 138 CONDUCTORS SHARING 20 AMPS THE REMAINING TWO CONDUCTORS ARE RATED 25 AMPS CONTINUOUSLY

D. PENETRATION CONTINUOUS RATING-CONDUCTORS UNEQUALLY LOADED(SEE NOTE ABOVE)

TIME IN SECONDS

CURRENT IN AMPERES

TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

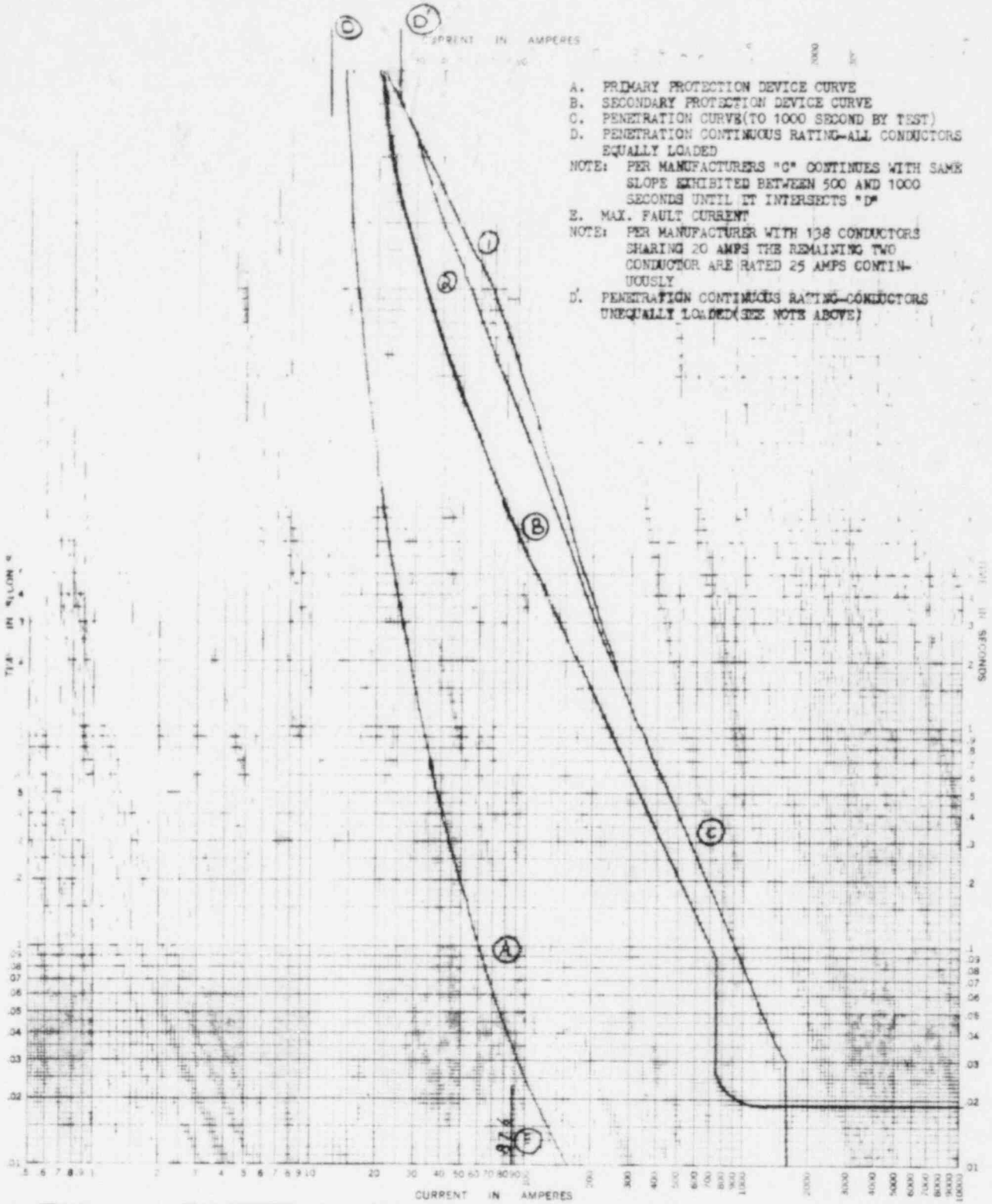
1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____
2. Curves are plotted to _____ Test points so variations should be _____

12050-SK(C)-12-2A
No.
Date 2/2/80 JMO

REV 1 9/15/80 TK

K+E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 48 5258

A. EATSMAN ABC-10A
B. GE THED -15A



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load
2. Curves are plotted to _____ Test points so variations should be _____

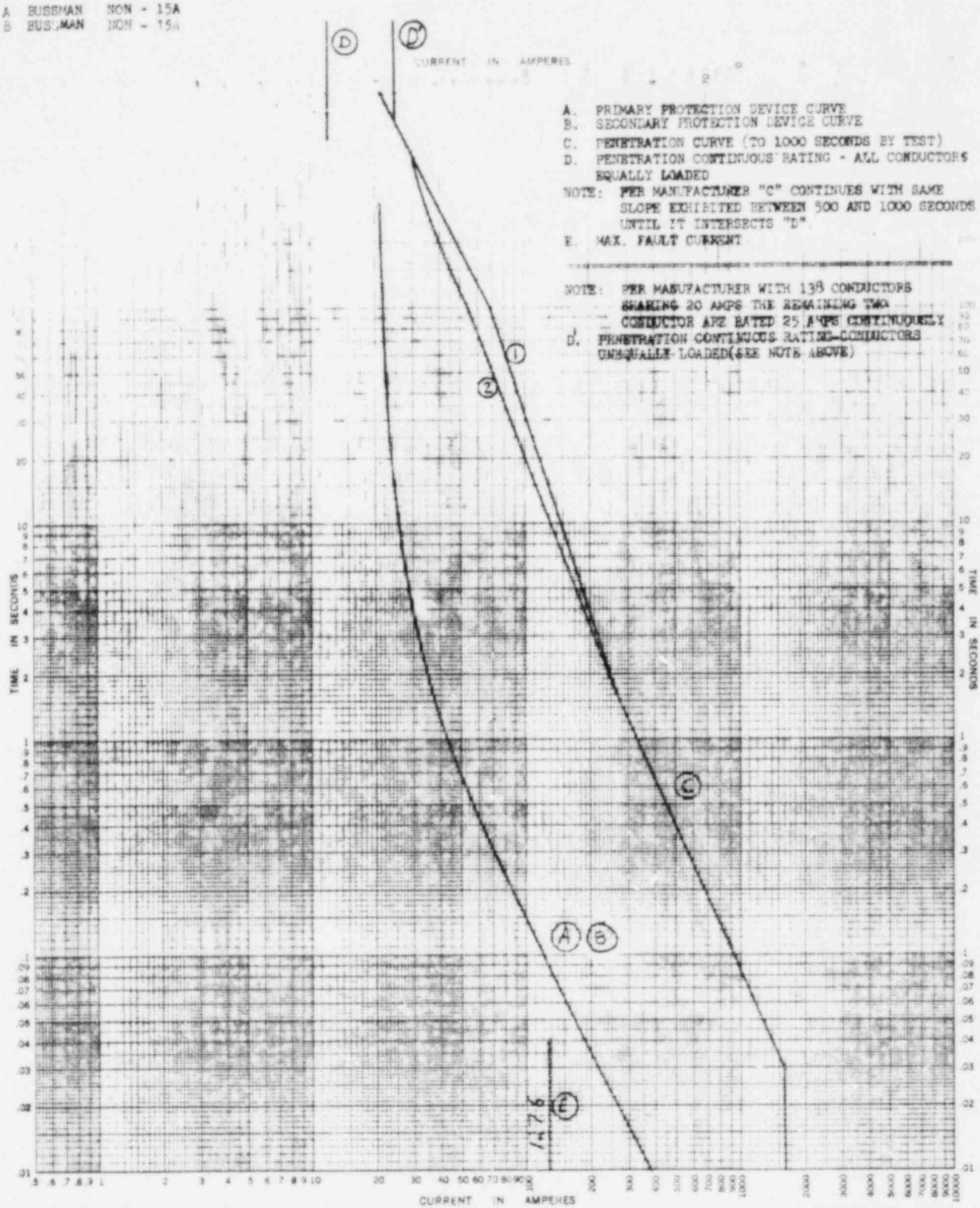
No. 12050-SK(C)-IB-2B

Date 9/15/82 TRC

K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 48 5258

#14 FEED THRU
1) SINGLE SEAL
2) TWO SEALS

A BUSSMAN NON - 15A
B BUSSMAN NON - 15A



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links: In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ a-c at _____ p-f., starting at 25C with no initial load.
2. Curves are plotted to _____ Test points so variations should be _____

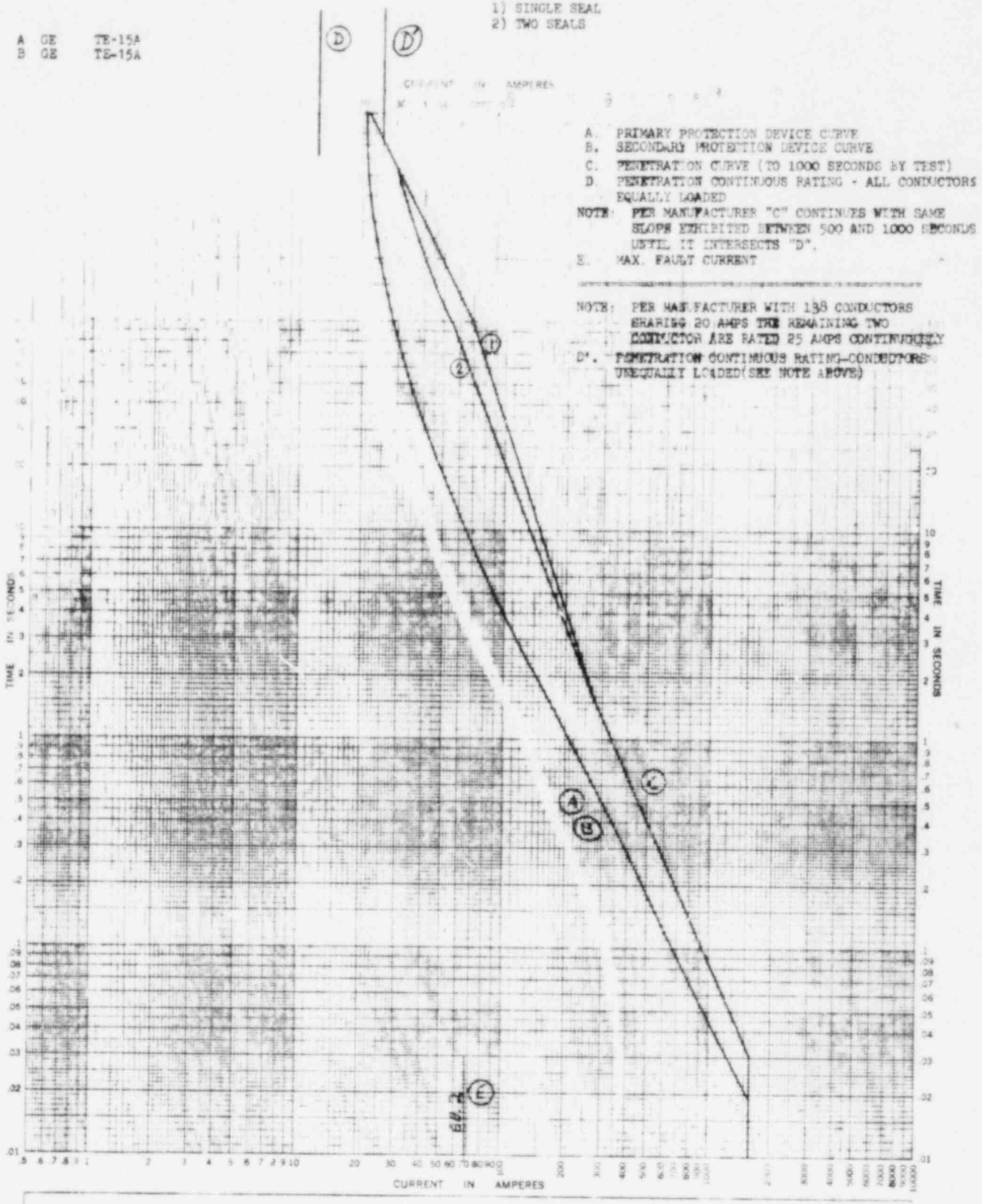
No. 12050-SK(C)-IB-3
Date 2/18/90 MRO

REV 1 9/4/90 TRC

K•E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 48 5258

#14 FEED THRU
1) SINGLE SEAL
2) TWO SEALS

A GE TE-15A
B GE TE-15A



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f. starting at 25C with no initial load
2. Curves are plotted to _____ Test points so variations should be _____

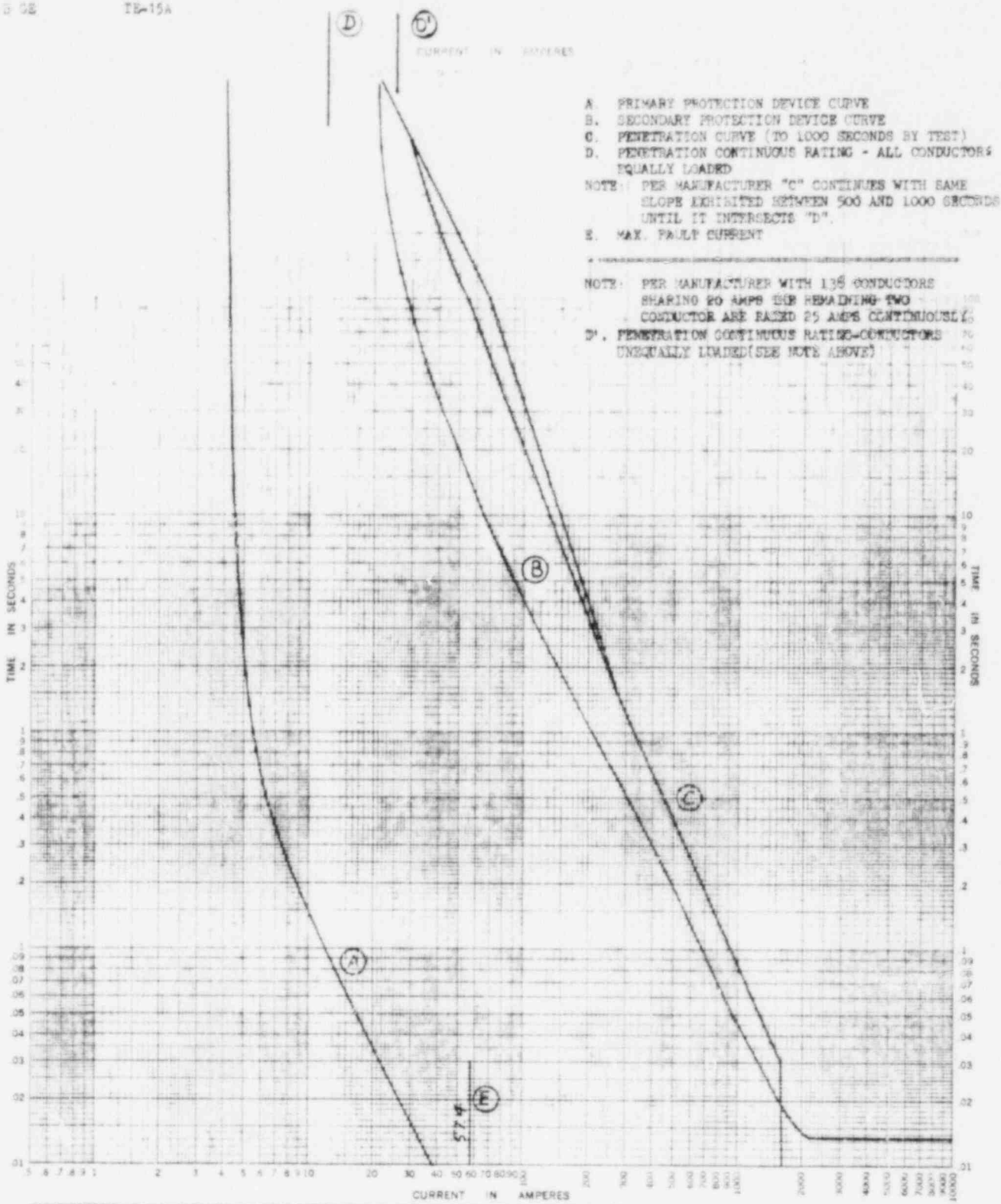
No. L2050-SX(C)-IB-4
Date 2/13,80 MM

K-E TIME-CURRENT CHARACTERISTIC

REV 1 9/15/80 MM

#14 FEED THRU
1) SINGLE SEAL
2) TWO SEALS

A BUSSMAN ABC-3A
B GE TE-15A



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p.f., starting at 25C with no initial load

2. Curves are plotted to _____ Test points so variations should be _____

No. 12050-3K(C)-IB-5

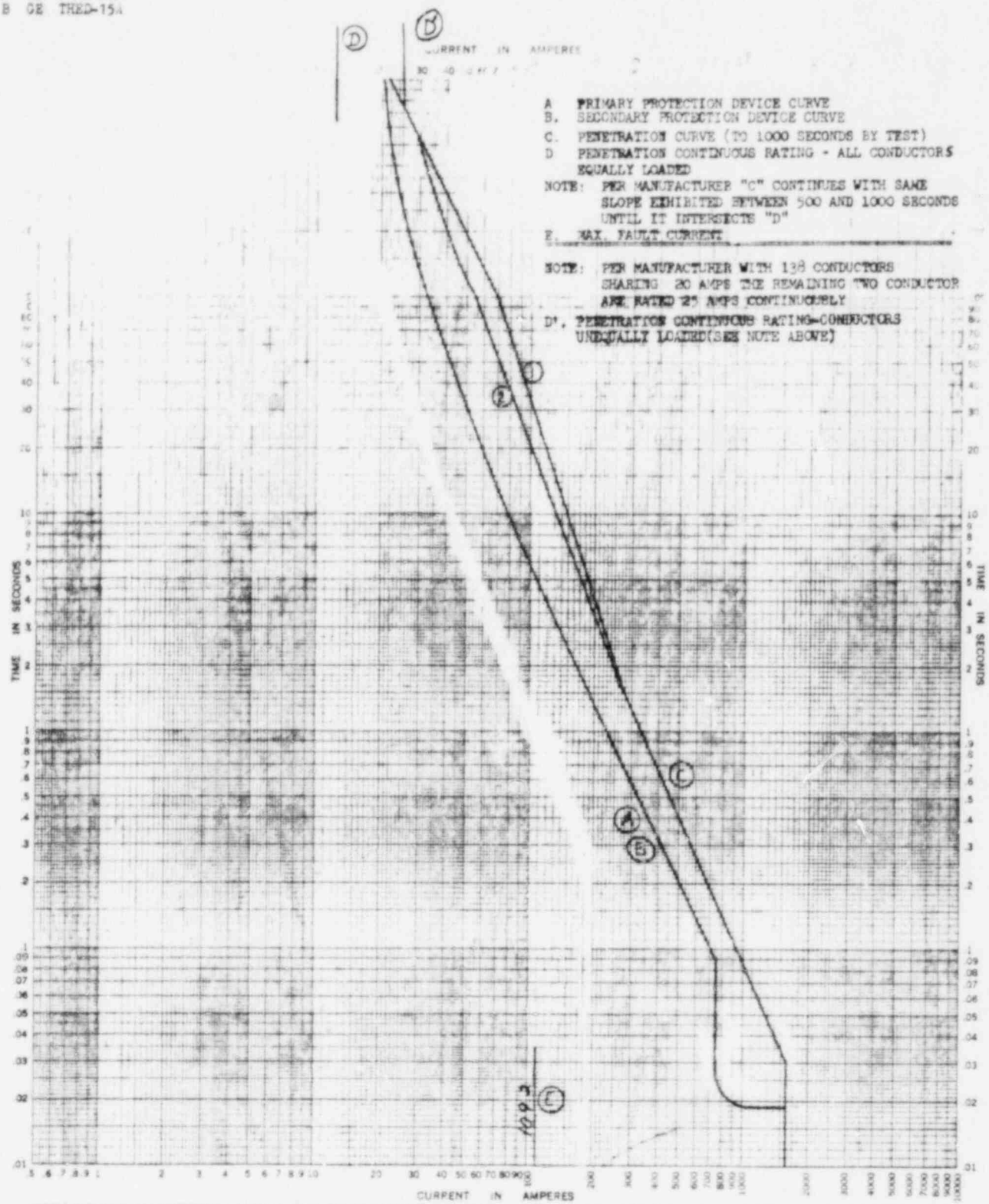
Date 2/19/80 WRD

K+E TIME-CURRENT CHARACTERISTIC 46 0210
KEUFFEL & ESSER CO.

REV 1 5/15/80 TM

#14 FEED THRU
1) SINGLE SEAL
2) TWO SEALS

A GE THED-15A
B GE THED-15A



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links to _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load

2. Curves are plotted to _____ Test points so variations should be _____

L2050-8K(C)-15-6

No.

Date 2/19/82 MTO

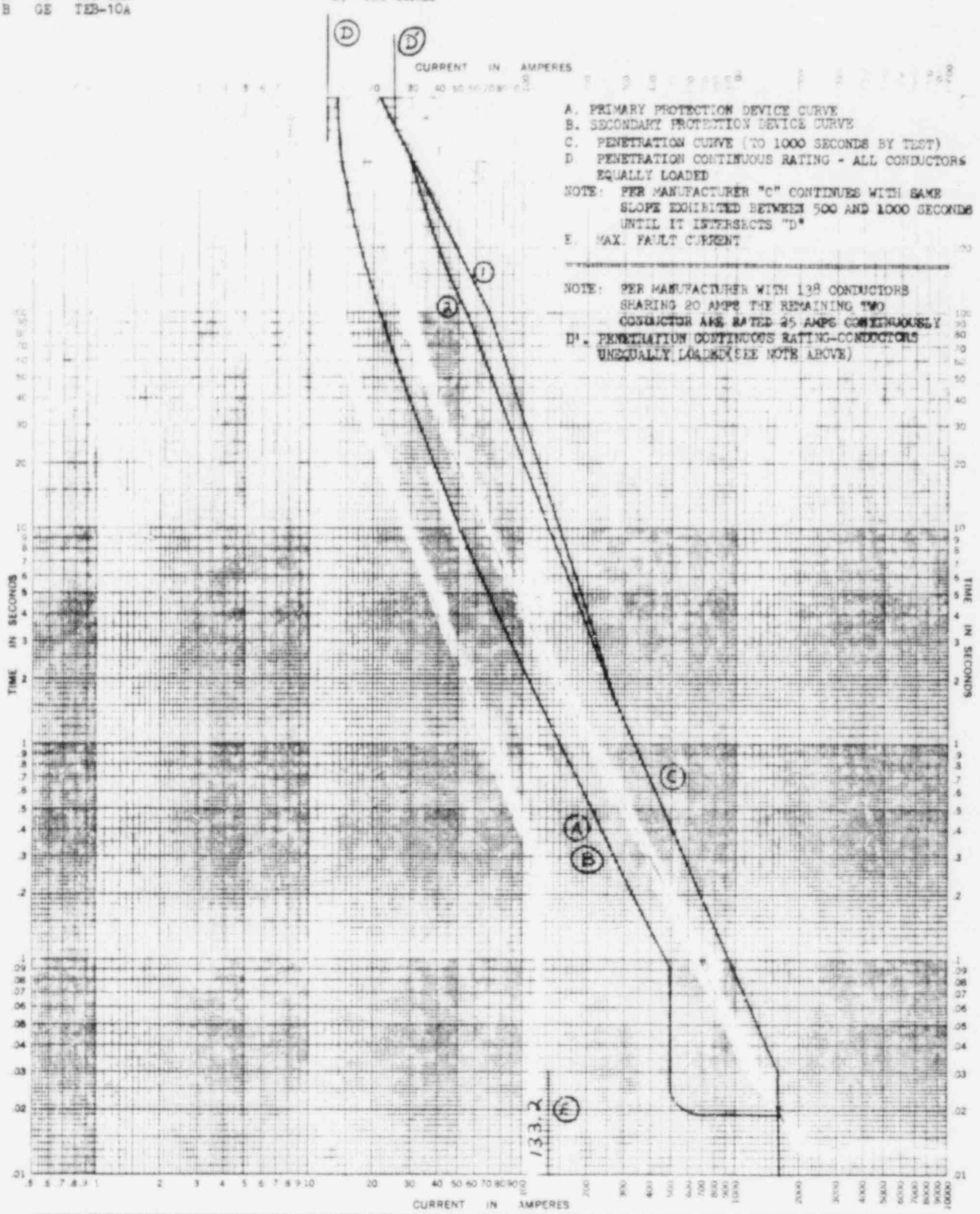
K&E TIME-CURRENT CHARACTERISTIC 48 5208
KEUFFEL & ESSER CO.

REV 1 9/15/83 TM

#14 FEED THRU

1) SINGLE SEAL
2) TWO SEALS

A GE TEB-10A
B GE TEB-10A



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load
2. Curves are plotted to _____ Test points so variations should be _____

No. 12050-SK(C)-IB-7

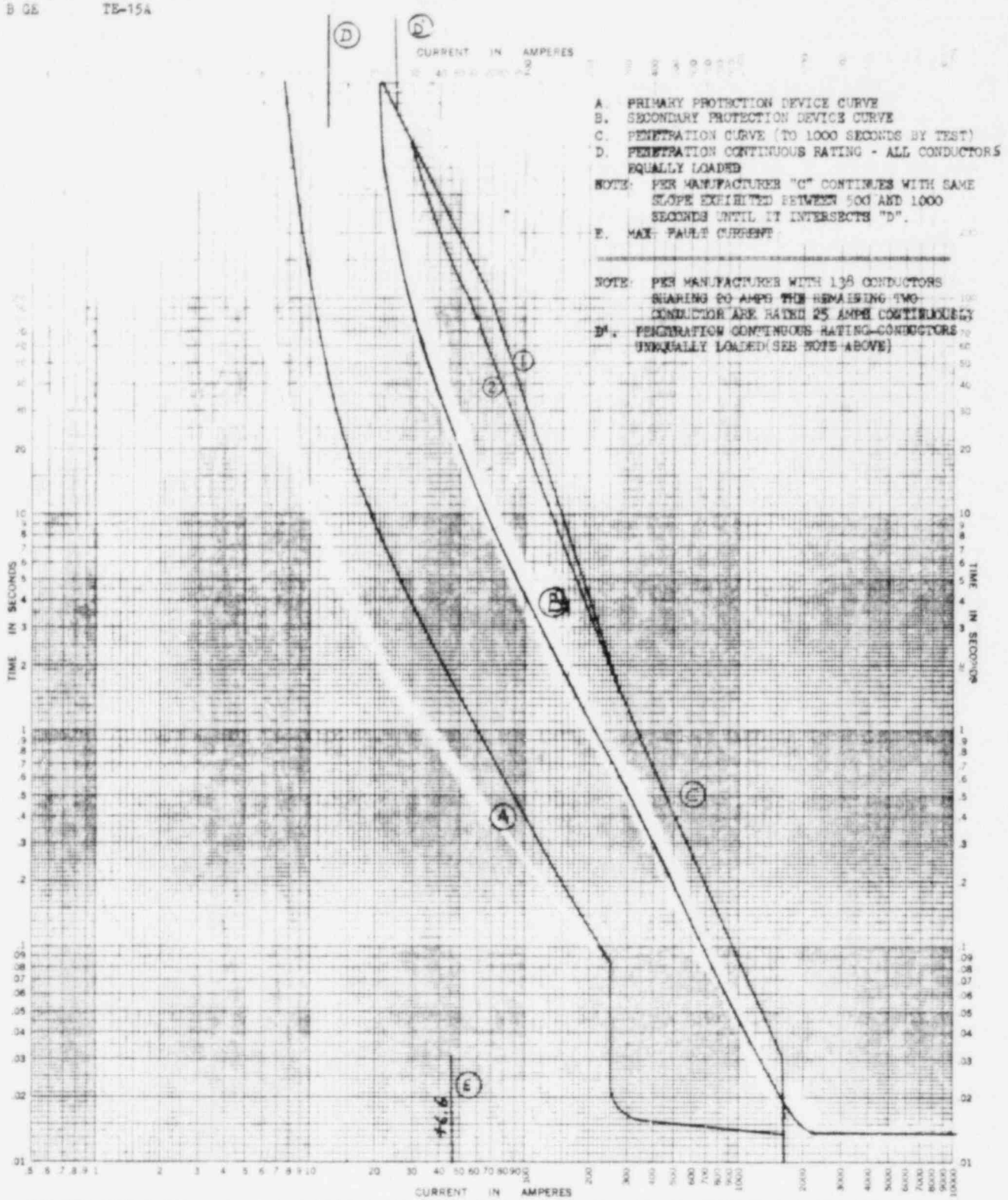
Date 2/19/80 JMD

K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 48 5258

REV 1 9/15/80 TMC.

#14 FEED THRU
1) SINGLE SEAL
2) TWO SEALS

A W QUIK LAG BRK 5A
B GE TE-15A



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____
2. Curves are plotted to _____ Test points so variations should be _____

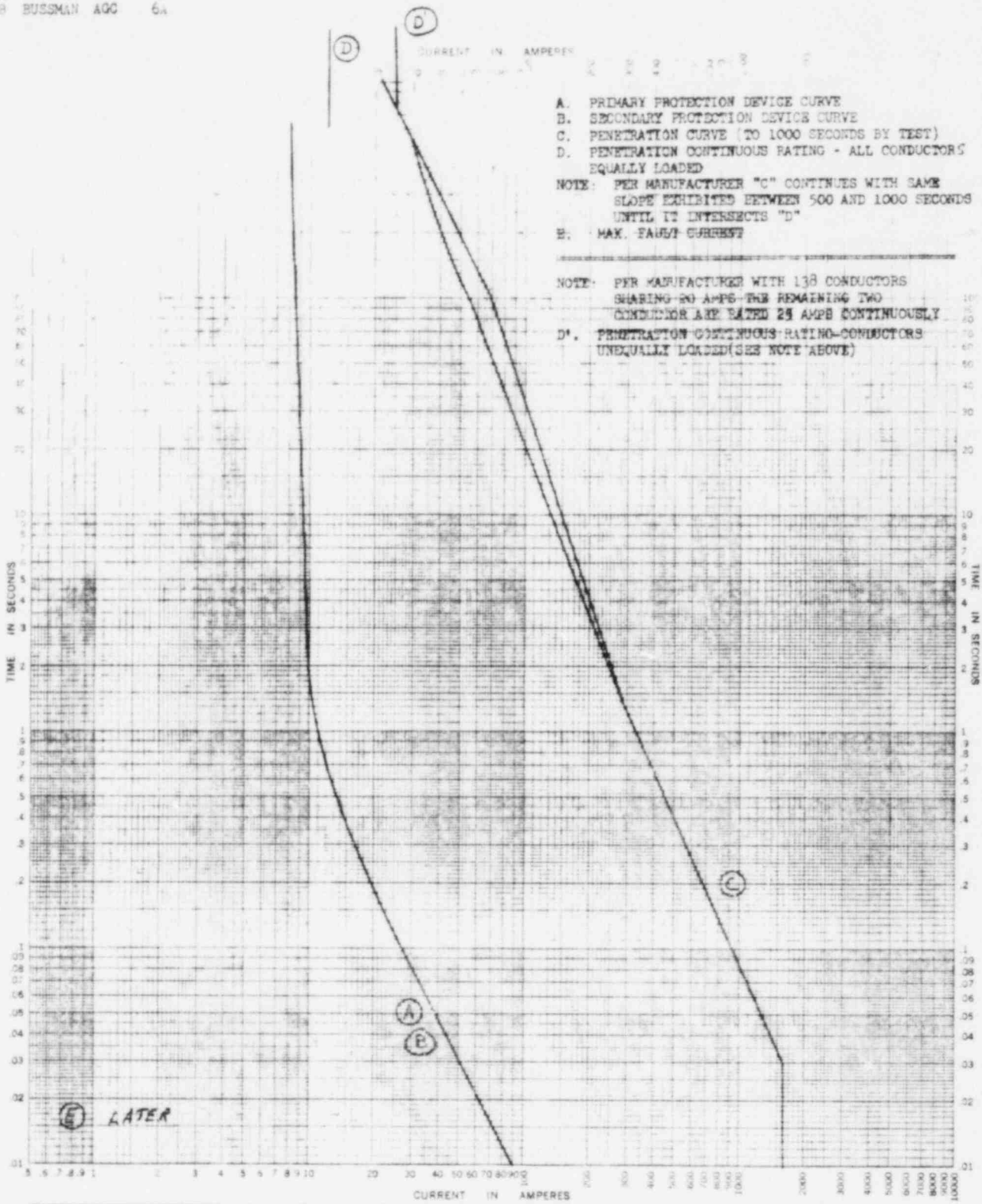
No. LR050-SK(C)-18-B
Date 2/18/80 MJO

REV 1 4/1/80 TJC

K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 48 5259

#14 FEED THRU
1) SINGLE SEAL
2) TWO SEALS

A BUSSMAN AGC 4A
B BUSSMAN AGC 6A



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links to _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p.f. starting at 25C with no initial load

2. Curves are plotted to _____ Test points so variations should be _____

No. 12050-SK(C)-IE-9

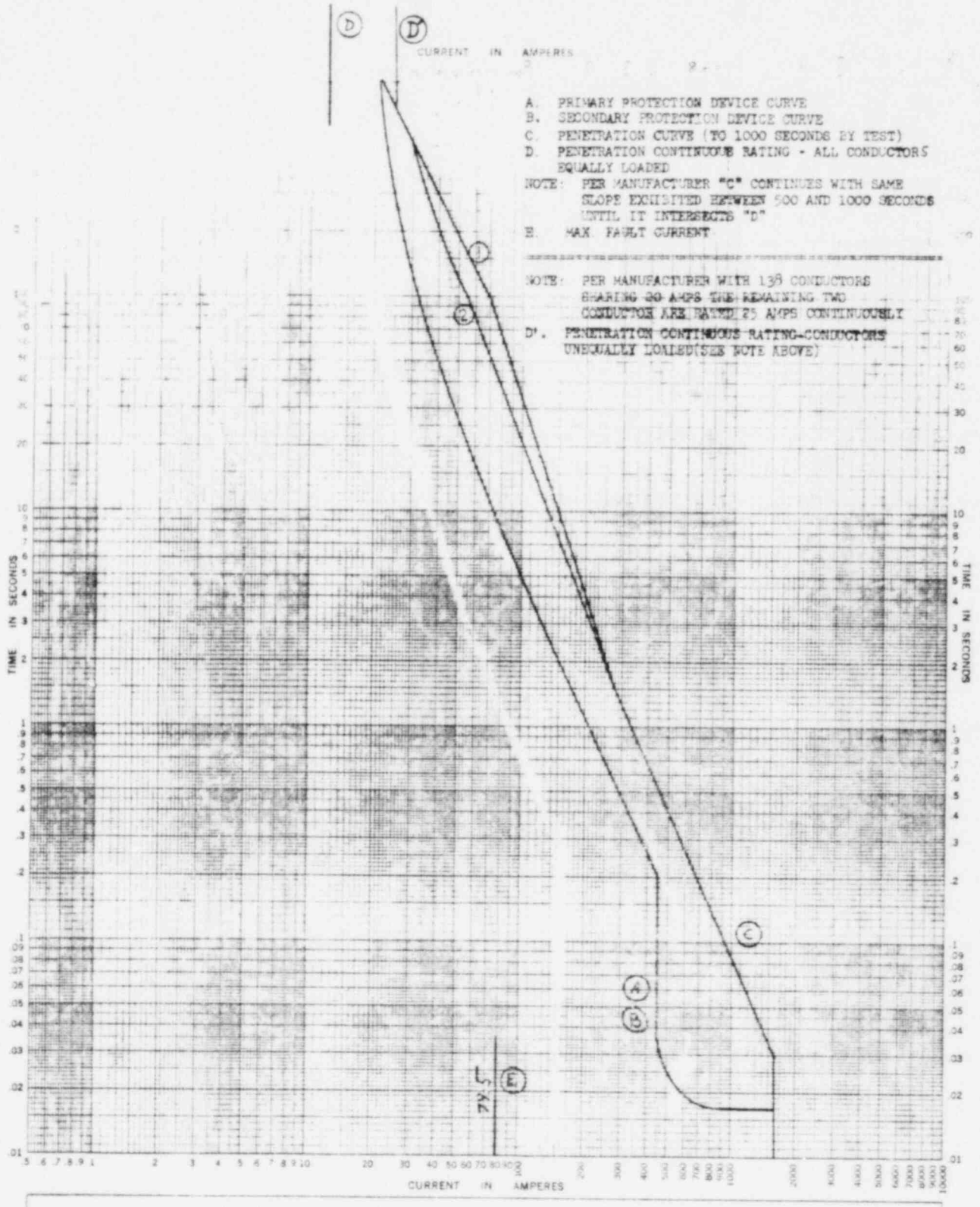
Date 2/18/80 JWD

PE. 1 2/15/10 TJC

K-E TIME-CURRENT CHARACTER STIC 48 5258

A GE TQD- 15A
B GE TQB- 15A

#14 FEED THRU
1) SINGLE SEAL
2) TWO SEALS



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a.c. at _____ p.f., starting at 25C with no initial load _____
2. Curves are plotted to _____ Test points so variations should be _____

No. 12050-8K(C)-1B-10

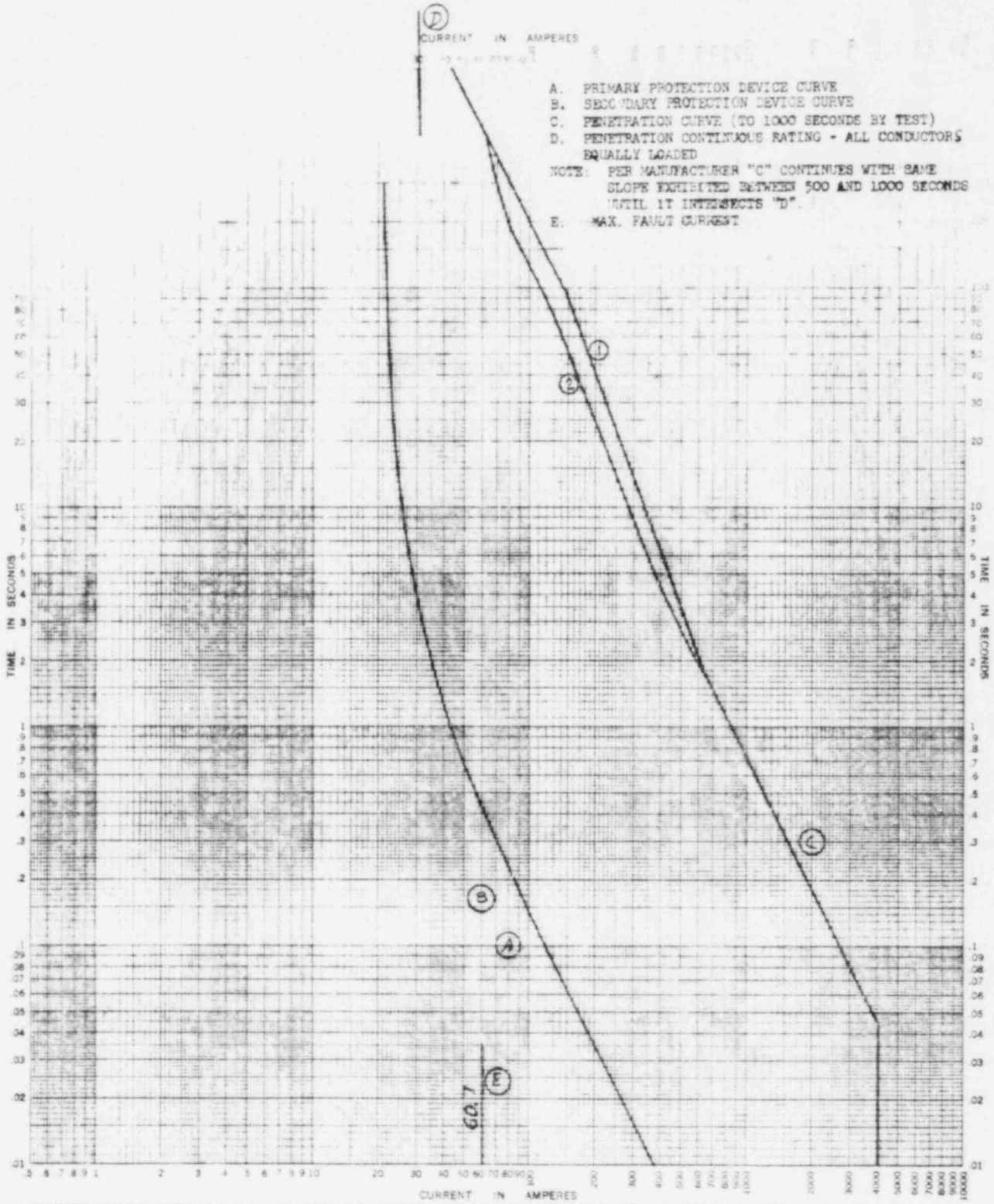
Date 2/19/80 WMD

K&E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 46 5258

AEU / 9/17/80 TPC

#10 FEED THRU
1) SINGLE SEAL
2) TWO SEALS

A BUSSMAN NON- 15A
B BUSSMAN NON-15A



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p.f., starting at 25C with no initial load

2. Curves are plotted to _____ Test points so variations should be _____

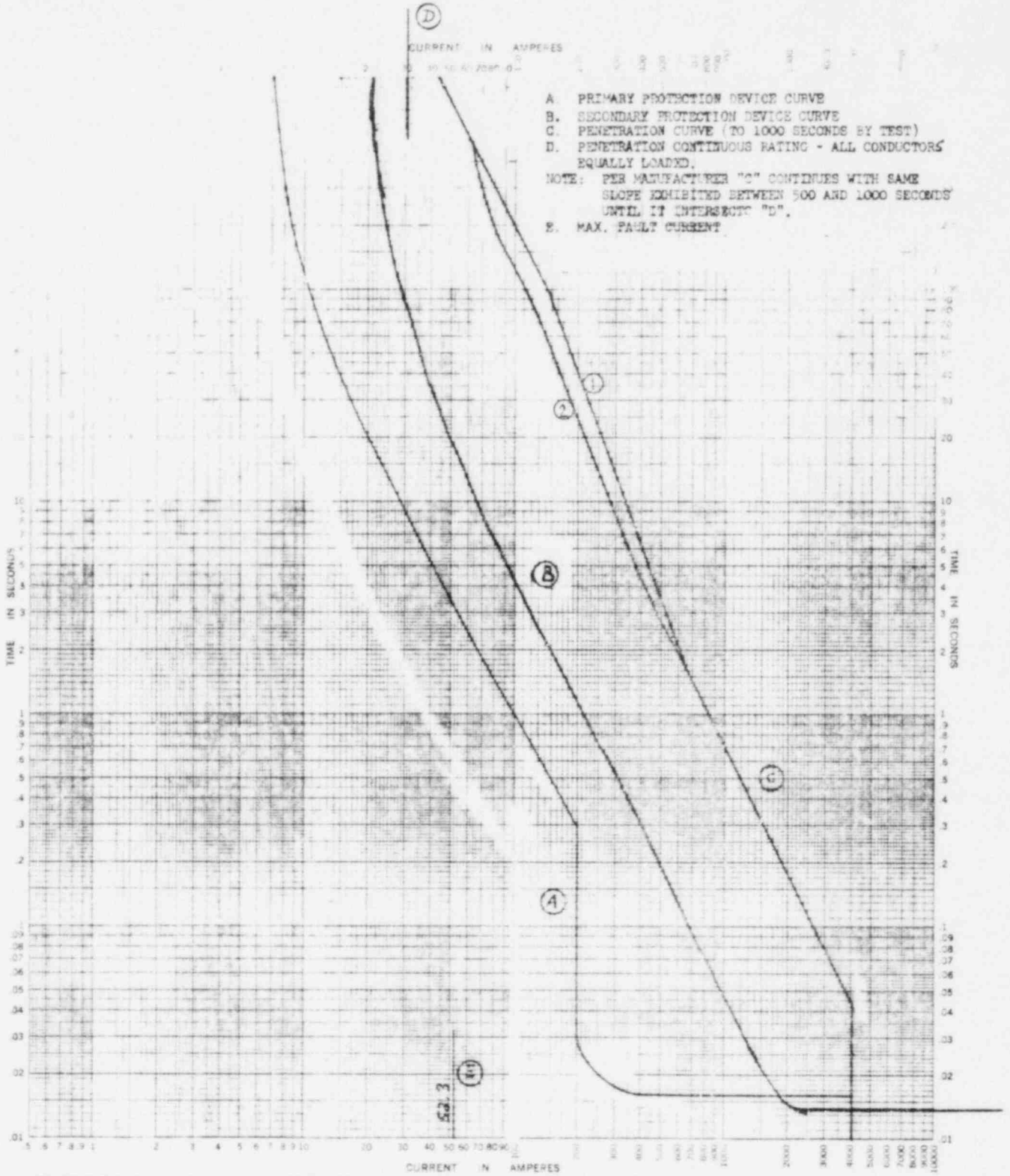
L2050-SK(C)-TC-1
No. _____
Date 2/12/80 MTO

K-E TIME-CURRENT CHARACTERISTIC 48 3258
KEUFFEL & ESSER CO.

REV1 4/15/80 TPC
REV 2 9/22/80 TPC

#10 FEED THRU
1) SINGLE SEAL
2) TWO SEALS

A GE TQB-5A
B GE TE-15A



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____

2. Curves are plotted to _____ Test points so variations should be _____

12050-UK(C)-1C-2

No. _____

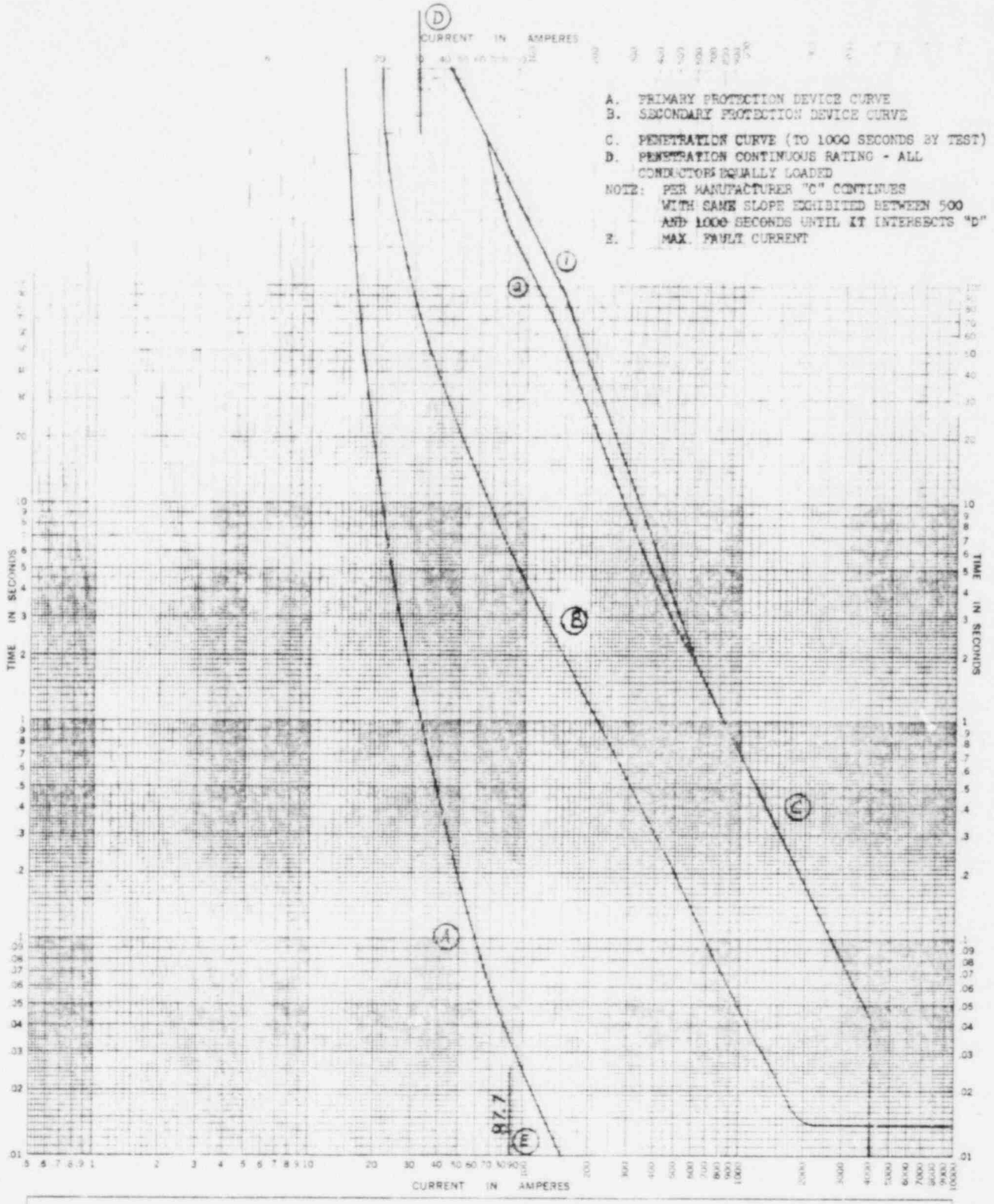
Date 2/9/80 JHO

K-E TIME-CURRENT CHARACTERISTIC 48 5258
KEUFFEL & ESSER CO.

PE 9/15/80 PR

#10 FEED THRU
1) SINGLE SEAL
2) TWO SEAL

A BUSSMAN ABC-10A
D GE TD-15A



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____
2. Curves are plotted to _____ Test points so variations should be _____

No. 12050-SK(C)-10-3

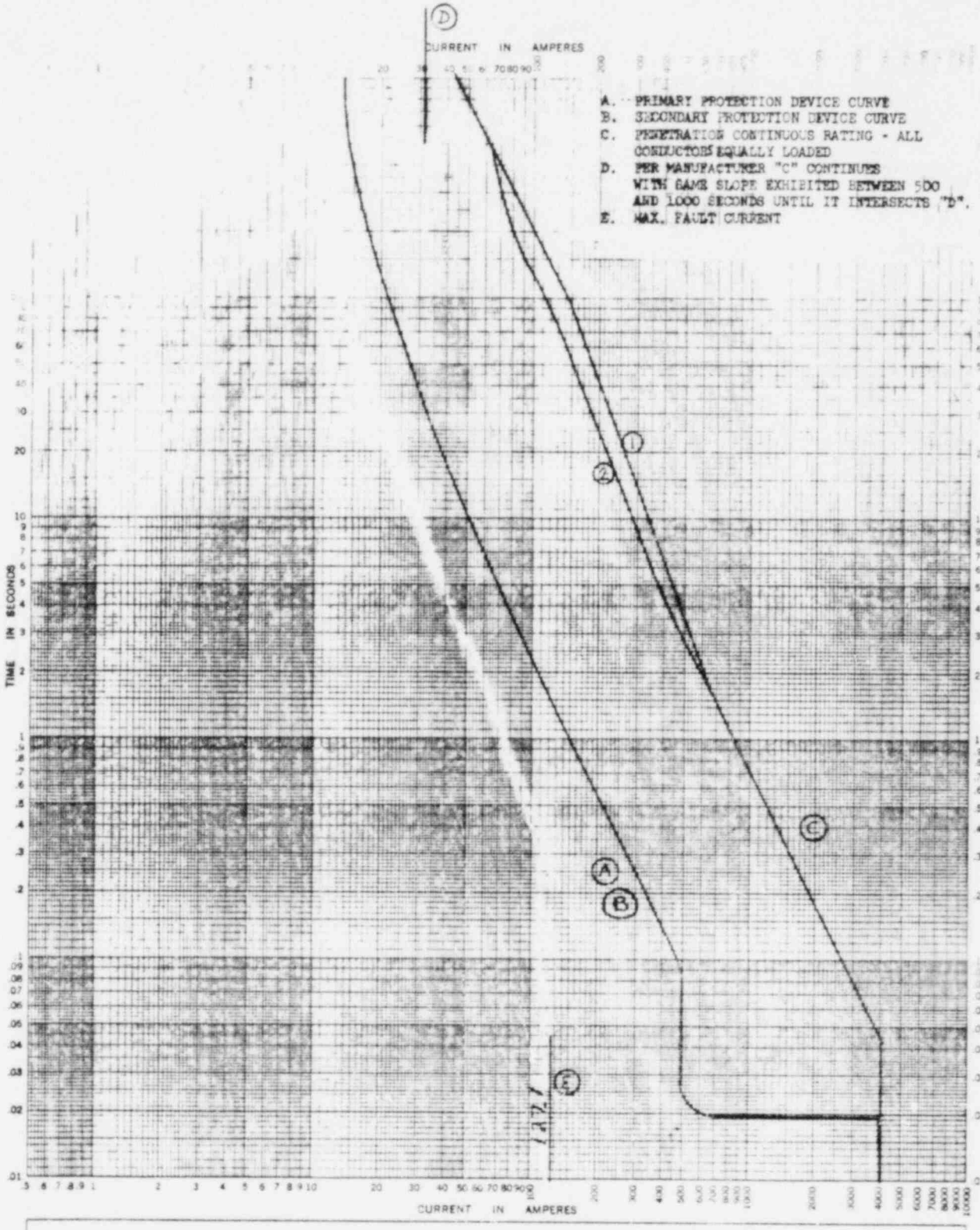
Date 2/13/80 MJO

REV. 1 4/15/80 TJK

K·E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 48 5258

#10 FEED THRU
1) SINGLE SEAL
2) TWO SEALS

A GE TEB-10A
B GE TEB-10A



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load.
2. Curves are plotted to _____ Test points so variations should be _____

12050-SK(C)-10-4

No. _____

Date 2/19/80 JMO

K+E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 46 5258

REV 1 4/7/80 TAC