

COM-QM87 Rev. A

Reliability Prediction Report

(MTBF)

Summary	Failure Rate: 6511.352073 ppm MTBF: 153,578 Hours
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Issue date	Approval	Test Engineer
2013/09/23	Tom Lin	Mike Lee

Reliability Prediction (MTBF)

I . Model Name: COM-QM87 Rev. A

II . Prediction Date: Sep. 23, 2013

III . Prediction Site: AAEON Q.E. Dept.

IV . Predicted by: Mike Lee

V . Equipment: Windchill Quality Solutions 10.1

VI. Simulation Environment:

- Temperature: 30 degrees C
- Standard: Telcordia (Bellcore) Standard

VII. Term and Definition:

- Unit : An assembly of device.
- Duty Cycle : Used to specify the percentage of time that the element is in an on state, and it is equal to the percentage of total time the item is in the active environment.
- Quantity : The quantity of the selected item.
- Failure Rate : Used to specify that the failure rate is to be calculated based the selected Calculation models. The Failure rate multiplier is 1000000000.
- MTBF : MTBF is always specified in hours.

VIII. Prediction Result:

COM-QM87 Rev. A (9697QM8702):

- Failure Rate: 6511.352073 ppm

- MTBF: 153,578 Hours

**AAEON Reliability Prediction
Summary**

File Name: COM-QM87A.rfp
Duty Cycle: 100
Calculation Model: Telcordia Issue 2
Method: Method I Case 3

Failure Rate: 6511.352073
MTBF (hrs): 153,578
Temperature: 30
Environment: GF, GU - Ground Fixed, Uncontrolled

Assembly Name	Part Number	Ref Des	Quantity	Failure Rate	MTBF
COM-QM87A	9697QM8702		1	6511.352073	153,578

File Name: COM-QM87A.rfp
Assembly: 9697QM8702
Ref Des:
Description:

Failure Rate: 6511.352073
MTBF (hrs): 153,578
Temperature: 30
Environment: GF, GU - Ground Fixed, Uncontrolled

Part Number	Category	Ref Des	Tem.Rise	Unit Failure Rate	Quantity	MTBF,Unit
1050500104	Resistor	R3,R32,R47		2.547039	3	107020754.986850
1050500334	Resistor	R2,R28,R46		2.547039	3	107020754.986850
1050501004	Resistor	R39		2.547039	1	282340674.079668
1050501234	Resistor	R583		2.547039	1	282340674.079668
1050502224	Resistor	R185,R190,R276, R293,R299,R300, R303,R349,R353, R358,R369,R392, R396,R675,R676, R678,R680,R682, R686,R692,R700, R704,R711,R714, R722,R84		2.547039	26	14061076.827148
1050502234	Resistor	R375		2.547039	1	282340674.079668
1050503324	Resistor	R467		2.547039	1	282340674.079668
1050503934	Resistor	R499		2.547039	1	282340674.079668
1050504724	Resistor	R234,R239,R295, R326,R329,R340, R345,R383,R785, R787,R826,R842, R843,R853,R855, R857,R861,R870, R872		2.547039	19	19019185.781770
1050504734	Resistor	R306,R432,R502, R517,R662,R667, R719,R801,R809		2.547039	9	38754445.632391
1050505134	Resistor	R25		2.547039	1	282340674.079668
1050505164	Resistor	R679		2.547039	1	282340674.079668
1050505604	Resistor	R452		2.547039	1	282340674.079668
1050505633	Resistor	R525		2.547039	1	282340674.079668
1050507524	Resistor	R107,R128,R578, R601,R606		2.547039	5	67008142.102588
1050507530	Resistor	R117,R13,R254,R489		2.547039	4	82309758.689546

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1050510034	Resistor	R100,R105,R132,R14,R200,R201,R24,R307,R327,R335,R354,R356,R366,R373,R374,R421,R422,R448,R455,R579,R580,R592,R670,R677,R698,R70,R708,R732,R733,R782,R791,R798,R799,R807,R808,R89,R904		2.547039	37	9991988.939157
1050520004	Resistor	R272,R418,R471,R62		2.547039	4	82309758.689546
1050520034	Resistor	R104		2.547039	1	282340674.079668
1050524004	Resistor	R495		2.547039	1	282340674.079668
1050524904	Resistor	R450,R463,R548,R554,R600,R611		2.547039	6	56573956.677649
1050533034	Resistor	R251,R758		2.547039	2	154078778.388085
1050533214	Resistor	R72		2.547039	1	282340674.079668
1050540224	Resistor	R529,R71		2.547039	2	154078778.388085
1050549964	Resistor	R456,R520,R521		2.547039	3	107020754.986850
1050564914	Resistor	R562		2.547039	1	282340674.079668
1050597604	Resistor	R257,R752		2.547039	2	154078778.388085
1050700002	Resistor	R145		2.547039	1	282340674.079668
1050700334	Resistor	R390,R391,R411		2.547039	3	107020754.986850
1050701504	Resistor	R136,R142,R638		2.547039	3	107020754.986850
1050704304	Resistor	R439,R443		2.547039	2	154078778.388085
1052500171	Resistor	R181,R630,R642,R650,R652,R690		2.547039	6	56573956.677649
1054700289	Resistor	R48,R531		2.547039	2	154078778.388085
1059700001	Resistor	R629,R900		2.547039	2	154078778.388085
1059702261	Resistor	R501		2.547039	1	282340674.079668

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1059710001	Resistor	R133,R570,R641, R715		2.547039	4	82309758.689546
105A500139	Resistor	R101,R188,R262, R264,R273,R274, R278,R316,R350, R377,R379,R426, R438,R444,R459, R460,R462,R465, R466,R530,R536,R57, R575,R576,R610, R623,R624,R626, R689,R812,R846,R91		2.547039	32	11502702.879433
105A501003	Resistor	R504		2.547039	1	282340674.079668
105A501039	Resistor	R102,R103,R109, R110,R112,R118, R119,R121,R124, R130,R138,R139, R140,R143,R149, R150,R157,R158, R167,R17,R172,R177, R179,R183,R187, R192,R199,R205, R208,R209,R210, R224,R228,R241, R261,R263,R267, R270,R271,R284,		2.547039	125	3038465.439273
105A501053	Resistor	R144		2.547039	1	282340674.079668
105A501529	Resistor	R348		2.547039	1	282340674.079668
105A501539	Resistor	R566,R598,R74		2.547039	3	107020754.986850

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105A501633	Resistor	R879		2.547039	1	282340674.079668
105A501829	Resistor	R477		2.547039	1	282340674.079668
105A502039	Resistor	R269,R423,R 526, R565,R742,R 8		2.547039	6	56573956.677649
105A502123	Resistor	R433,R503,R 518		2.547039	3	107020754.986850
105A503039	Resistor	R564,R567,R 73		2.547039	3	107020754.986850
105A503309	Resistor	R233,R243,R 250, R259,R297,R 381, R753,R764,R 773, R793		2.547039	10	35079934.879747
105A505109	Resistor	R151,R441,R 451, R476		2.547039	4	82309758.689546
105A505603	Resistor	R515		2.547039	1	282340674.079668
105A506829	Resistor	R892,R893,R 898		2.547039	3	107020754.986850
105A506833	Resistor	R481		2.547039	1	282340674.079668
105A507503	Resistor	R445		2.547039	1	282340674.079668
105A507509	Resistor	R425		2.547039	1	282340674.079668
105A507533	Resistor	R266		2.547039	1	282340674.079668
105A510003	Resistor	R458,R475		2.547039	2	154078778.388085
105A510009	Resistor	R288,R333,R 364, R382,R428,R 431,R80		2.547039	7	48991237.965885
105A510733	Resistor	R11		2.547039	1	282340674.079668
105A513009	Resistor	R437,R510		2.547039	2	154078778.388085
105A513323	Resistor	R614		2.547039	1	282340674.079668
105A514733	Resistor	R869		2.547039	1	282340674.079668
105A515009	Resistor	R162,R170,R 174, R522		2.547039	4	82309758.689546
105A515033	Resistor	R12		2.547039	1	282340674.079668
105A517813	Resistor	R38		2.547039	1	282340674.079668
105A522623	Resistor	R468		2.547039	1	282340674.079668
105A522663	Resistor	R736		2.547039	1	282340674.079668
105A526123	Resistor	R573		2.547039	1	282340674.079668
105A527403	Resistor	R265,R745		2.547039	2	154078778.388085
105A530113	Resistor	R399		2.547039	1	282340674.079668
105A539003	Resistor	R85		2.547039	1	282340674.079668
105A547033	Resistor	R783		2.547039	1	282340674.079668
105A553629	Resistor	R483		2.547039	1	282340674.079668
105A561933	Resistor	R248		2.547039	1	282340674.079668
105A564903	Resistor	R684		2.547039	1	282340674.079668

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105A700003	Resistor	FB3,R106,R113,R127,R147,R152,R155,R168,R169,R194,R23,R249,R26,R268,R275,R30,R498,R516,R569,R581,R582,R588,R590,R597,R605,R613,R625,R688,R706,R747,R749,R760,R767,R768,R865,R878,R88,R881,R889		2.547039	39	9493970.778443
105A700009	Resistor	R10,R115,R120,R129,R131,R146,R161,R180,R182,R19,R204,R21,R211,R22,R222,R223,R227,R27,R277,R29,R31,R33,R331,R332,R34,R343,R359,R36,R360,R361,R362,R37,R386,R387,R388,R389,R393,R394,R4,R40,R406,R42,R429,R43,R430,R44,R461,R464,R480,R482		2.547039	92	4106168.814407
105A700139	Resistor	R114,R279,R486,R770		2.547039	4	82309758.689546
105A701009	Resistor	R640		2.547039	1	282340674.079668
105A701039	Resistor	R535,R549		2.547039	2	154078778.388085

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105A701053	Resistor	R137,R230,R252, R291,R298,R82		2.547039	6	56573956.677649
105A701059	Resistor	R281,R289,R296, R363		2.547039	4	82309758.689546
105A701069	Resistor	R235		2.547039	1	282340674.079668
105A702209	Resistor	R221,R232,R240, R717		2.547039	4	82309758.689546
105A702229	Resistor	R75,R800,R860, R868		2.547039	4	82309758.689546
105A702239	Resistor	R18		2.547039	1	282340674.079668
105A702269	Resistor	R159,R41,R49, R9		2.547039	4	82309758.689546
105A706209	Resistor	R453		2.547039	1	282340674.079668
105A708229	Resistor	R246,R256,R328, R608,R617,R657, R685,R693,R696, R703,R727,R729, R754,R94		2.547039	14	25477245.255648
105A710009	Resistor	R175,R178,R184, R191,R206,R207, R212,R213,R214, R218		2.547039	10	35079934.879747
105A710039	Resistor	R558,R655		2.547039	2	154078778.388085
105A733009	Resistor	R416,R417		2.547039	2	154078778.388085
105B500172	Resistor	R1,R563		2.547039	2	154078778.388085
105B501039	Resistor	R725,R762		2.547039	2	154078778.388085

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Part Number	Category	Ref Des	Tem.Rise	Unit Failure Rate	Quantity	MTBF,Unit
105B700009	Resistor	R125,R148,R153, R154,R156,R160, R165,R171,R173, R176,R196,R203, R220,R236,R237, R238,R244,R283, R311,R320,R321, R322,R334,R352, R355,R367,R368, R371,R376,R378, R380,R400,R408, R409,R435,R442, R446,R447,R541, R728		2.547039	91	4150431.630548
105B710039	Resistor	R728		2.547039	1	282340674.079668
106B501032	Resistor	RT1,RT2,RT3,RT5, RT6		7.724580	5	18169856.865461
106B510030	Resistor	RT4		7.724580	1	66247589.526685

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Part Number	Category	Ref Des	Tem.Rise	Unit Failure Rate	Quantity	MTBF,Unit
1121501690	Capacitor	C102,C105,C106, C108,C109,C122, C127,C131,C193, C194,C20,C344,C360, C369,C374,C375, C383,C384,C385, C387,C397,C399, C404,C405,C406, C411,C418,C419, C422,C423,C427, C428,C432,C435, C437,C479,C505, C537,C86,C93,C9		1.128806	44	19402916.060511
1121501691	Capacitor	C12		1.128806	1	704977644.692287
1124418090	Capacitor	C123,C124,C92,C98		1.128806	4	196873384.410843
1124427080	Capacitor	C101,C396		1.128806	2	375289731.076049
1124427090	Capacitor	C346		1.128806	1	704977644.692287
1124522680	Capacitor	C88		1.128806	1	704977644.692287
1124533191	Capacitor	C539		1.128806	1	704977644.692287
1124533280	Capacitor	C56,C60		1.128806	2	375289731.076049
1124547190	Capacitor	C186		1.128806	1	704977644.692287
1124547280	Capacitor	C8		1.128806	1	704977644.692287

**Reliability Prediction
Summary**

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1129522790	Capacitor	C326,C342,C453, C454,C455,C456, C457,C458,C459, C460,C461,C462, C463,C464,C465, C466,C467,C468, C481,C482,C483, C484,C485,C486, C487,C488,C489, C490,C491,C492, C493,C494,C495, C496		1.128806	34	24984844.161172
1129610051	Capacitor	C370,C371		1.128806	2	375289731.076049
1129610080	Capacitor	C11,C114,C221,C222, C231,C250,C259, C277,C281,C292, C294,C301,C305, C307,C309,C313, C316,C321,C327, C328,C330,C333, C338,C347,C348, C349,C350,C390, C469,C470,C471, C497,C509,C519,C7		1.128806	35	24285352.591796

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1129701790	Capacitor	C142,C148,C149, C151,C152,C157, C158,C169,C170, C180,C181,C182, C183,C314,C325, C341,C351,C353, C372,C431,C508, C517,C521,C522, C523,C524,C55,C58		1.128806	28	30212160.975569
1129701791	Capacitor	C14		1.128806	1	704977644.692287
1129710090	Capacitor	C133,C136,C168		1.128806	3	257514172.353070
1129710390	Capacitor	C304,C376,C45,C536, C57,C99		1.128806	6	133979725.056342
1129722091	Capacitor	C154,C163		1.128806	2	375289731.076049
1129747091	Capacitor	C23		1.128806	1	704977644.692287
1189615154	Capacitor	C352,C365,C366, C367,C377		4.744484	5	36944177.000623
1189622154	Capacitor	C331,C510,C540		4.744484	3	59399119.141203
1189633151	Capacitor	C480		4.744484	1	159663026.715137
1189647185	Capacitor	C232,C251,C276		4.744484	3	59399119.141203
1189922181	Capacitor	C398		4.744484	1	159663026.715137
1189933180	Capacitor	C191,C297		4.744484	2	86049450.747498
11A4922690	Capacitor	C22		1.128806	1	704977644.692287
11C1515440	Capacitor	C1,C16,C29		1.128806	3	257514172.353070
11C2501050	Capacitor	C228,C391		1.128806	2	375289731.076049
11C2510190	Capacitor	C416,C426		1.128806	2	375289731.076049
11C2510480	Capacitor	C111,C255,C27,C40, C417,C429,C9		1.128806	7	115633865.771428
11C4501050	Capacitor	C13,C25,C39		1.128806	3	257514172.353070
11C4501790	Capacitor	C103		1.128806	1	704977644.692287
11C4510280	Capacitor	C203		1.128806	1	704977644.692287
11C4522290	Capacitor	C17,C30,C4		1.128806	3	257514172.353070
11C4547690	Capacitor	C506		1.128806	1	704977644.692287

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11C9510490	Capacitor	C302,C310,C44		1.128806	3	257514172.353070
11E1510050	Capacitor	C130,C450		1.128806	2	375289731.076049
11E1533780	Capacitor	C26		1.128806	1	704977644.692287
11E2510060	Capacitor	C18,C188,C189,C190,C198,C2,C230,C24,C249,C283,C291,C296,C3,C31,C34		1.128806	15	55479656.844874
11E2522090	Capacitor	C400,C430		1.128806	2	375289731.076049
11E9501091	Capacitor	C10,C100,C104,C110,C113,C126,C128,C166,C200,C204,C205,C206,C207,C21,C216,C217,C218,C223,C224,C225,C226,C235,C236,C237,C238,C240,C243,C244,C245,C246,C247,C256,C257,C258,C260,C267,C268,C270,C273,C280,C286,		1.128806	80	10772660.612835

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11E9510490	Capacitor	C116,C117,C118, C132,C134,C135, C137,C138,C139, C140,C141,C143, C144,C145,C146, C147,C150,C153, C155,C156,C160, C161,C162,C164, C165,C167,C171, C184,C185,C187, C192,C195,C196, C197,C199,C261, C263,C265,C266,		1.128806	130	6668395.526194
11E9522680	Capacitor	C129,C241,C445, C447		1.128806	4	196873384.410843
11E9522790	Capacitor	C5		1.128806	1	704977644.692287
11E9547681	Capacitor	C28		1.128806	1	704977644.692287
11E9610080	Capacitor	C107,C125,C211, C214,C215,C239, C329,C362		1.128806	8	101746760.035398
11E9622050	Capacitor	C19,C209,C210,C212, C213,C219,C227, C229,C234,C242, C248,C252,C253, C262,C271,C275, C279,C287,C289, C295,C300,C303, C368,C441,C448,C91		1.128806	26	32480878.530766
11E9622080	Capacitor	C527		1.128806	1	704977644.692287

File Name: COM-QM87A.rfp
Assembly: 9697QM8702
Ref Des:
Description:

Failure Rate: 6511.352073
MTBF (hrs): 153,578
Temperature: 30
Environment: GF, GU - Ground Fixed, Uncontrolled

Part Number	Category	Ref Des	Tem.Rise	Unit Failure Rate	Quantity	MTBF,Unit
1211000180	Inductor	L8	18.2	6.845834	1	111772664.059562
1211101064	Inductor	L4	16.4	6.639980	1	115237864.167170
1211102470	Inductor	L1		4.944252	3	57363284.375370
1211102470	Inductor	L2	18	2.274255	3	124708307.381071
1211102470	Inductor	L3	16.1	6.606057	3	42933101.143527
121110476V	Inductor	L10		4.944252	1	154760964.143460
1211105675	Inductor	L9	14.4	6.415899	1	119262655.024239
1211147072	Inductor	L5,L7		4.944252	2	83201062.149749
12123C0007	Inductor	FB2		4.944252	1	154760964.143460
12123C0010	Inductor	FB4,FB5		4.944252	2	83201062.149749
1301005444	Semiconductor	D1,D18,D19, D20,D24, D25,D29,D3, D32,D34, D5,D7		7.793411	12	9662455.000384
1301005447	Semiconductor	D21,D22		7.793411	2	50578095.223398
1301005450	Semiconductor	D10,D11,D12 ,D13, D14,D15,D16 ,D17,D2, D26,D27,D28 ,D30, D31,D33		7.793411	15	7809407.629947
1301053040	Semiconductor	D23		7.793411	1	92807310.010983
1301400642	Semiconductor	D4		7.793411	1	92807310.010983
1304001340	Semiconductor	LED1,LED2		7.793411	2	50578095.223398
1304300140	Semiconductor	LED3		7.793411	1	92807310.010983
1309009940	Semiconductor	D8,D9		7.793411	2	50578095.223398
1310390413	Semiconductor	Q10,Q11,Q2 7,Q39, Q42		22.463360	5	7551839.591592
1311390612	Semiconductor	Q25		22.463360	1	31642600.748419
1315013810	Semiconductor	Q23		22.463360	1	31642600.748419
1315482110	Semiconductor	Q19,Q24,Q2 9,Q32		22.463360	4	9270607.712006
1315482410	Semiconductor	Q20,Q40		22.463360	2	17315095.066101
1315493511	Semiconductor	Q22		22.463360	1	31642600.748419
1315493910	Semiconductor	Q21		22.463360	1	31642600.748419
1315495710	Semiconductor	Q14		22.463360	1	31642600.748419
1315667910	Semiconductor	Q35		22.463360	1	31642600.748419

File Name: COM-QM87A.rfp
Assembly: 9697QM8702
Ref Des:
Description:

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Part Number	Category	Ref Des	Tem.Rise	Unit Failure Rate	Quantity	MTBF,Unit
1315700216	Semiconductor	Q12,Q15,Q16,Q18,Q26,Q28,Q30,Q31,Q33,Q34,Q36,Q37,Q38,Q4,Q41,Q43,Q44,Q45,Q46,Q48,Q49,Q5,Q50,Q51,Q52,Q53,Q54,Q55,Q56,Q57,Q58,Q59,Q9		22.463360	33	1262760.774886
1315700217	Semiconductor	Q17		22.463360	1	31642600.748419
1315805710	Semiconductor	Q2		22.463360	1	31642600.748419
1315806511	Semiconductor	Q13,Q3		22.463360	2	17315095.066101
1430516310	Integrated Circuit	U3		43.803003	1	11739202.588727
1430973740	Integrated Circuit	U1,U4,U6		43.803003	3	4923240.069161
1440217LM0	Integrated Circuit	U32		43.803003	1	11739202.588727
14454400E0	Integrated Circuit	U5	20	165.223215	1	3112228.085442
14482QM870	Integrated Circuit	U15	19.2	157.174719	1	3271596.929592
1469128350	Integrated Circuit	U24		43.803003	1	11739202.588727
14S2321900	Integrated Circuit	U17		43.803003	1	11739202.588727
14S2951600	Integrated Circuit	U30		43.803003	1	11739202.588727
14S3121600	Integrated Circuit	U2		43.803003	1	11739202.588727
14S3121700	Integrated Circuit	U14	24.1	212.597866	1	2418708.795691
14S3621601	Integrated Circuit	U50		43.803003	1	11739202.588727
14S3917900	Integrated Circuit	U19,U48		43.803003	2	6834791.244197
14S3973100	Integrated Circuit	U13		43.803003	1	11739202.588727
14S4081102	Integrated Circuit	U21		43.803003	1	11739202.588727
14S4851800	Integrated Circuit	U52		43.803003	1	11739202.588727
14S5A00702	Integrated Circuit	U29,U55		26.018600	2	14194252.866846
14S5A00704	Integrated Circuit	U38		26.018600	1	25551442.237972
14S5A00821	Integrated Circuit	U10,U18,U22,U23,U33,U36,U39,U40,U41,U43,U8		26.018600	11	3042425.072547
14S5A01402	Integrated Circuit	U46		26.018600	1	25551442.237972
14S5A12506	Integrated Circuit	U34,U51,U54		26.018600	3	9949526.289768
14S6216060	Integrated Circuit	U35		11.063278	1	58231413.220643
14S6324640	Integrated Circuit	U45		11.063278	1	58231413.220643
14S9108500	Integrated Circuit	U42,U44,U9		26.018600	3	9949526.289768
14S9230500	Integrated Circuit	U11,U12		26.018600	2	14194252.866846
14S9330600	Integrated Circuit	U25,U26,U27,U28,U47,U49		26.018600	6	5329254.552198

**Reliability Prediction
Summary**

File Name: COM-QM87A.rfp
Assembly: 9697QM8702
Ref Des:
Description:

Failure Rate: 6511.352073
MTBF (hrs): 153,578
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Part Number	Category	Ref Des	Tem.Rise	Unit Failure Rate	Quantity	MTBF,Unit
14S9751100	Integrated Circuit	U16	26.4	76.157024	1	8729500.084944
1540782282	Resistor	RP1,RP2		9.971436	2	30043399.401299
1600000403	Connection	SW1		16.184835	1	35685591.360212
1651520400	Connection	DIMM1		16.184835	1	35685591.360212
16515A2995	Connection	DIMM2		16.184835	1	35685591.360212
1653212100	Connection	CN6		16.184835	1	35685591.360212
16540M0000	Connection	CN1,CN2		16.184835	2	20390152.380746
1655902122	Connection	CN3		16.184835	1	35685591.360212
1655902130	Connection	CN5		16.184835	1	35685591.360212
1655907130	Connection	CN4		16.184835	1	35685591.360212