Rev: 00 July 2018

IEEE 13 Bus Feeder

RTDS Technologies

Contents

1. CASE INFORMATION

Case Name	IEEE13.dft
Location	Tutorial/Samples/Distribution System/IEEE13/
Created by	Melanie Dyck
Revision	00 – July 2018
Target	GPC, PB5, NovaCor
Minimum Hardware	1 x NovaCor Chassis with at least 2 enabled cores 1 x PB5 based rack with at least 3 PB5 Cards 1 x GPC based rack with at least 3 GPC Cards
Keywords	IEEE 13, Test Feeder, Distribution System, 1-3 Phase, Regulator, Short Transmission Lines, Overhead Lines, Underground Lines, Shunt Capacitors, Unbalanced Loading
Purpose	• Distribution System • IEEE 13 Node Test Feeder

2. INTRODUCTION

The IEEE 13 bus feeder is a small system that is used to test distribution systems. It operates at 4.16kV, has 1 source, a regulator, a number of short unbalanced transmission lines, and shunt capacitors. Figure 1 shows the one line diagram of the test system [1]. The data pertaining to the system are given in Section 3. The results from the IEEE 13 Test Feeder document and the RSCAD steady state results are compared in Section 4 to show that a close match can be achieved. Section 5 lists references related to the data and models used in the system.

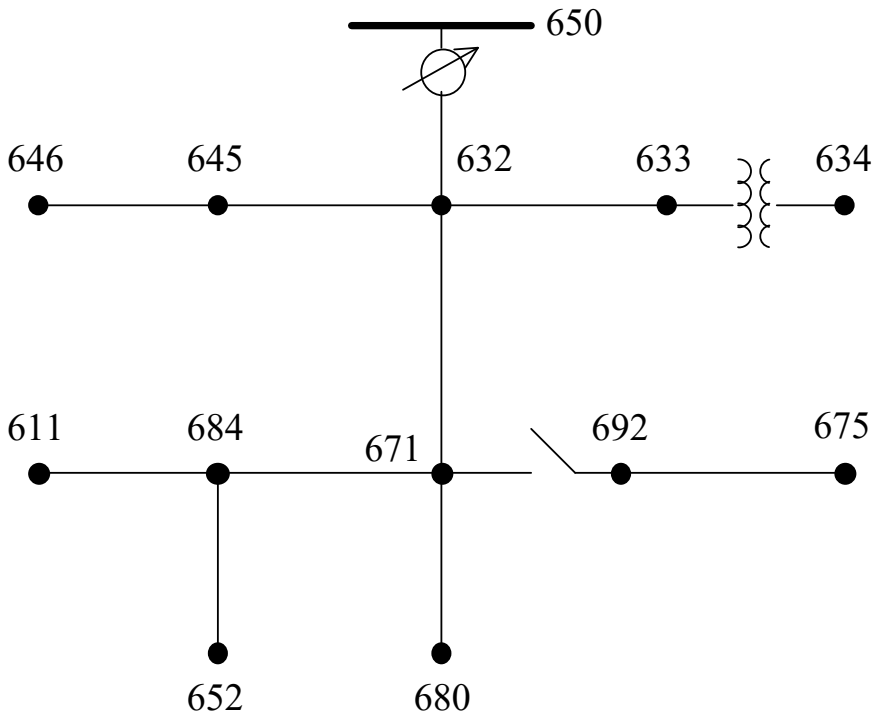

Figure 1 : One-Line Diagram of IEEE 13 Bus Power System [1]

3. SYSTEM DATA

The detailed system data can be found in the IEEE 13 Node Test Feeder Document [1]. It can be downloaded from the following website:

http://sites.ieee.org/pes-testfeeders/resources/

The regulator controls were derived from the same PSCAD case referenced in the RSCAD IEEE 34 Node Test Feeder case and altered to reflect the IEEE 13 Node Test Feeder regulator specifications.

It is important to note that the pi-section model used in RSCAD (rtds_risc_MATPI4) is expecting the shunt capacitance for one end of the pi-section only. The capacitance given in the IEEE document must then be divided by 2. It is also important to note that the MATPI model requests the capacitance from the wire to ground. This is not equal to C11, C22 or C33. The data given in the IEEE document is the shunt capacitance matrix and the data on the diagonal is C11, C22, C33 or (B11, B22, B33). The capacitance from node 1 to ground must then be calculated, for example C1g = C11 – C12 – C13.

4. COMPARISON OF RESULTS

Table 1: RTDS Steady State Results Compared to IEEE Results

BUS	|Va| (pu)		∠Va (deg)		|Vb| (pu)		∠Vb (deg)		|Vc| (pu)		∠Vc (deg)	
	RTDS	IEEE	RTDS	IEEE	RTDS	IEEE	RTDS	IEEE	RTDS	IEEE	RTDS	IEEE
650	0.9997	1.0000	0.00	0.00	0.9998	1.0000	-120.00	-120.00	0.9997	1.0000	120.00	120.00
RG60	1.0646	1.0625	0.00	0.00	1.0521	1.0500	-120.00	-120.00	1.0664	1.0687	120.00	120.00
632	1.0235	1.0210	-2.48	-2.49	1.0442	1.0420	-121.71	-121.72	1.0149	1.0174	117.81	117.83
633	1.0205	1.0180	-2.55	-2.56	1.0423	1.0401	-121.75	-121.77	1.0123	1.0148	117.81	117.82
634	0.9966	0.9940	-3.21	-3.23	1.0241	1.0218	-122.20	-122.22	0.9934	0.9960	117.33	117.34
645					1.0351	1.0329	-121.88	-121.90	1.0129	1.0155	117.84	117.86
646					1.0333	1.0311	-121.96	-121.98	1.0109	1.0134	117.89	117.90
671	0.9927	0.9900	-5.28	-5.30	1.0551	1.0529	-122.32	-122.34	0.9751	0.9778	115.99	116.02
680	0.9927	0.9900	-5.28	-5.30	1.0551	1.0529	-122.32	-122.34	0.9751	0.9778	115.99	116.02
684	0.9908	0.9881	-5.30	-5.32					0.9731	0.9758	115.89	115.92
611									0.9711	0.9738	115.75	115.78
652	0.9852	0.9825	-5.22	-5.25								
692	0.9927	0.9900	-5.28	-5.31	1.0551	1.0529	-122.32	-122.34	0.9751	0.9777	115.99	116.02
675	0.9864	0.9835	-5.52	-5.56	1.0575	1.0553	-122.49	-122.52	0.9730	0.9758	116.02	116.03

Table 2: Power Flow Results at Bus 650

Input	Phase A		Phase B		Phase C		Total	
	RTDS	IEEE	RTDS	IEEE	RTDS	IEEE	RTDS	IEEE
kW	1254.439	1251.398	978.215	977.332	1349.094	1348.461	3581.749	3577.191
kVAr	680.004	681.570	372.535	373.418	668.695	669.784	1721.230	1724.772
kVA	1426.893	1424.968	1046.751	1046.241	1505.725	1505.642	3973.861	3971.289
PF	0.8791	0.8782	0.9345	0.9341	0.8960	0.8956	0.9013	0.9008

5. REFERENCES

[1] IEEE 13 Node Test Feeder Document. http://sites.ieee.org/pes-testfeeders/resources/