Table B-1: Bus Data (`mpc.bus`)

name	column	description
BUS_I	1	bus number (positive integer)
BUS_TYPE	2	bus type (1 = PQ, 2 = PV, 3 = ref, 4 = isolated)
PD	3	real power demand (MW)
QD	4	reactive power demand (MVAr)
GS	5	shunt conductance (MW demanded at V = 1.0 p.u.)
BS	6	shunt susceptance (MVAr injected at V = 1.0 p.u.)
BUS_AREA	7	area number (positive integer)
VM	8	voltage magnitude (p.u.)
VA	9	voltage angle (degrees)
BASE_KV	10	base voltage (kV)
ZONE	11	loss zone (positive integer)
VMAX	12	maximum voltage magnitude (p.u.)
VMIN	13	minimum voltage magnitude (p.u.)
LAM_P†	14	Lagrange multiplier on real power mismatch (u/MW)
LAM_Q†	15	Lagrange multiplier on reactive power mismatch (u/MVAr)
MU_VMAX†	16	Kuhn-Tucker multiplier on upper voltage limit (u/p.u.)
MU_VMIN†	17	Kuhn-Tucker multiplier on lower voltage limit (u/p.u.)

† Included in OPF output, typically not included (or ignored) in input matrix. Here we assume the objective function has units u.

Table B-2: Generator Data (mpc.gen)

name	column	description
GEN_BUS	1	bus number
PG	2	real power output (MW)
QG	3	reactive power output (MVAr)
QMAX	4	maximum reactive power output (MVAr)
QMIN	5	minimum reactive power output (MVAr)
VG‡	6	voltage magnitude setpoint (p.u.)
MBASE	7	total MVA base of machine, defaults to baseMVA
GEN_STATUS	8	machine status, > 0 = machine in-service, ≤ 0 = machine out-of-service
PMAX	9	maximum real power output (MW)
PMIN	10	minimum real power output (MW)
PC1*	11	lower real power output of PQ capability curve (MW)
PC2*	12	upper real power output of PQ capability curve (MW)
QC1MIN*	13	minimum reactive power output at PC1 (MVAr)
QC1MAX*	14	maximum reactive power output at PC1 (MVAr)
QC2MIN*	15	minimum reactive power output at PC2 (MVAr)
QC2MAX*	16	maximum reactive power output at PC2 (MVAr)
RAMP_AGC*	17	ramp rate for load following/AGC (MW/min)
RAMP_10*	18	ramp rate for 10 minute reserves (MW)
RAMP_30*	19	ramp rate for 30 minute reserves (MW)
RAMP_Q*	20	ramp rate for reactive power (2 sec timescale) (MVAr/min)
APF*	21	area participation factor
MU_PMAX†	22	Kuhn-Tucker multiplier on upper P_g limit (u/MW)
MU_PMIN†	23	Kuhn-Tucker multiplier on lower P_g limit (u/MW)
MU_QMAX†	24	Kuhn-Tucker multiplier on upper Q_g limit (u/MVAr)
MU_QMIN†	25	Kuhn-Tucker multiplier on lower Q_g limit (u/MVAr)

* Not included in version 1 case format.

† Included in OPF output, typically not included (or ignored) in input matrix. Here we assume the objective function has units u.

‡ Used to determine voltage setpoint for optimal power flow only if opf.use_vg option is non-zero (0 by default). Otherwise generator voltage range is determined by limits set for corresponding bus in bus matrix.

Table B-3: Branch Data (`mpc.branch`)

name	column	description
F_BUS	1	"from" bus number
T_BUS	2	"to" bus number
BR_R	3	resistance (p.u.)
BR_X	4	reactance (p.u.)
BR_B	5	total line charging susceptance (p.u.)
RATE_A*	6	MVA rating A (long term rating), set to 0 for unlimited
RATE_B*	7	MVA rating B (short term rating), set to 0 for unlimited
RATE_C*	8	MVA rating C (emergency rating), set to 0 for unlimited
TAP	9	transformer off nominal turns ratio, if non-zero (taps at "from" bus, impedance at "to" bus, i.e. if $r = x = b = 0$, $tap = \frac{\lvert V_f \rvert}{\lvert V_t \rvert}$; $tap = 0$ used to indicate transmission line rather than transformer, i.e. mathematically equivalent to transformer with $tap = 1$)
SHIFT	10	transformer phase shift angle (degrees), positive $\Rightarrow$ delay
BR_STATUS	11	initial branch status, 1 = in-service, 0 = out-of-service
ANGMIN†	12	minimum angle difference, $\theta_f - \theta_t$ (degrees)
ANGMAX†	13	maximum angle difference, $\theta_f - \theta_t$ (degrees)
PF‡	14	real power injected at "from" bus end (MW)
QF‡	15	reactive power injected at "from" bus end (MVAr)
PT‡	16	real power injected at "to" bus end (MW)
QT‡	17	reactive power injected at "to" bus end (MVAr)
MU_SF§	18	Kuhn-Tucker multiplier on MVA limit at "from" bus (u/MVA)
MU_ST§	19	Kuhn-Tucker multiplier on MVA limit at "to" bus (u/MVA)
MU_ANGMIN§	20	Kuhn-Tucker multiplier lower angle difference limit (u/degree)
MU_ANGMAX§	21	Kuhn-Tucker multiplier upper angle difference limit (u/degree)

* Used to specify branch flow limits. By default these are limits on apparent power with units in MVA. However, the `'opf.flow_lim'` option can be used to specify that the limits are active power or current, in which case the ratings are specified in MW or ($\text{kA} \cdot V_{\text{basekV}}$), respectively. For current this is equivalent to an MVA value at a 1 p.u. voltage.

† Not included in version 1 case format. The voltage angle difference is taken to be unbounded below if `ANGMIN` ≤ -360 and unbounded above if `ANGMAX` ≥ 360. If both parameters are zero, the voltage angle difference is unconstrained.

‡ Included in power flow and OPF output, ignored on input.

§ Included in OPF output, typically not included (or ignored) in input matrix. Here we assume the objective function has units u.