In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.preprocessing
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mrlsquary_score, confusion_matrix, classification_report, mean_squared_error, mean_absolute_error
from sklearn.preprocessing import StandardScaler
```

In [2]:
```
machine = pd.read_csv('D:\124 - Machine_Learning\download files\machine.data', sep=",")
machine
```

Out[2]:

	adviser	32/60	125	256	6000	256.1	16	128	198	199
0	amdahl	470v/7	29	8000	32000	32	8	32	269	253
1	amdahl	470v/7a	29	8000	32000	32	8	32	220	253
2	amdahl	470v/7b	29	8000	32000	32	8	32	172	253
3	amdahl	470v/7c	29	8000	16000	32	8	16	132	132
4	amdahl	470v/5	26	8000	32000	64	8	32	318	290
...	...	...	...	...	...	...	...	...	...	...
203	spwry	8/85	124	1000	8000	0	1	8	42	37
204	spwry	9000-model-3	98	1000	8000	32	2	8	46	50
205	sratus	32	125	2000	8000	0	2	14	52	41
206	wang	vs-100	480	512	8000	32	0	0	67	47
207	wang	vs-90	480	1000	4000	0	0	0	45	25

208 rows × 10 columns

In [3]:
```
machine.isnull()
```

Out[3]:

	adviser	32/60	125	256	6000	256.1	16	128	198	199
0	False	False	False	False	False	False	False	False	False	False
1	False	False	False	False	False	False	False	False	False	False
2	False	False	False	False	False	False	False	False	False	False
3	False	False	False	False	False	False	False	False	False	False
4	False	False	False	False	False	False	False	False	False	False
...	...	...	...	...	...	...	...	...	...	...
203	False	False	False	False	False	False	False	False	False	False
204	False	False	False	False	False	False	False	False	False	False
205	False	False	False	False	False	False	False	False	False	False
206	False	False	False	False	False	False	False	False	False	False
207	False	False	False	False	False	False	False	False	False	False

208 rows × 10 columns

In [4]:
```
machine.info()
```

Out[4]:
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 208 entries, 0 to 207
Data columns (total 10 columns):
 #   Column   Non-Null Count  Dtype
---  ------   --------------  -----
 0   adviser  208 non-null    object
 1   32/60    208 non-null    object
 2   125      208 non-null    int64
 3   256      208 non-null    int64
 4   6000     208 non-null    int64
 5   256.1    208 non-null    int64
 6   16       208 non-null    int64
 7   128      208 non-null    int64
 8   198      208 non-null    int64
 9   199      208 non-null    int64
dtypes: int64(8), object(2)
memory usage: 16.4 KB
```

In [5]:
```
machine.describe()
```

Out[5]:

	125	256	6000	256.1	16	128	198	199
count	208.000000	208.000000	208.000000	208.000000	208.000000	208.000000	208.000000	208.000000
mean	204.261923	2880.538462	11824.918231	24.086534	4.644231	17.674385	105.177885	98.892962
std	260.953916	3083.630300	11747.919663	37.417999	6.797186	24.913375	181.080323	154.974961
min	17.000000	64.000000	64.000000	0.000000	0.000000	0.000000	0.000000	15.000000
25%	50.000000	768.000000	4000.000000	0.000000	1.000000	5.000000	27.000000	28.000000
50%	110.000000	2000.000000	8000.000000	8.000000	2.000000	8.000000	49.500000	45.000000
75%	225.000000	4000.000000	16000.000000	32.000000	4.000000	24.000000	111.500000	99.500000
max	1500.000000	32000.000000	64000.000000	256.000000	52.000000	176.000000	1150.000000	1238.000000

In [6]:
```
machine.shape
```

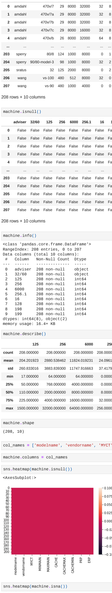
Out[6]:
```
(208, 10)
```

In [7]:
```
col_names = ['modelname', 'vendorname', 'MYCT', 'MINMAIN', 'MAXMAIN', 'CACHE', 'CACHEMAX', 'CACHEMIN', 'PRP', 'ERP']
```

In [8]:
```
machine.columns = col_names
```

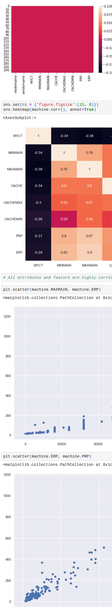
In [9]:
```
sns.heatmap(machine.isnull())
```

Out[9]:
```
<AxesSubplot:>
```



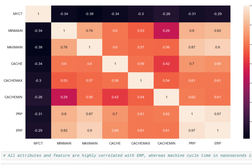
In [10]:
```
sns.heatmap(machine.isna())
```

Out[10]:
```
<AxesSubplot:>
```



In [11]:
```
sns.set(rc = {'figure.figsize':(15, 8)})
sns.heatmap(machine.corr(), annot=True)
```

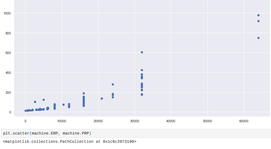
Out[11]:
```
<AxesSubplot:>
```



In [12]:
```
# All attributes and feature are highly correlated with ERP, whereas machine cycle time in nanoseconds is negatively correlated
```

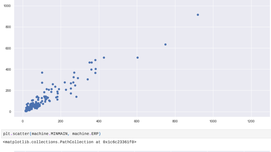
In [13]:
```
plt.scatter(machine.MAXMAIN, machine.ERP)
```

Out[13]:
```
<matplotlib.collections.PathCollection at 0x1c0c2873580>
```



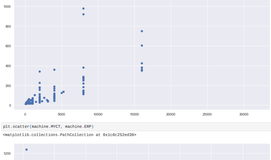
In [14]:
```
plt.scatter(machine.ERP, machine.PRP)
```

Out[14]:
```
<matplotlib.collections.PathCollection at 0x1c0c2873199>
```



In [15]:
```
plt.scatter(machine.MINMAIN, machine.ERP)
```

Out[15]:
```
<matplotlib.collections.PathCollection at 0x1c0c2336197>
```

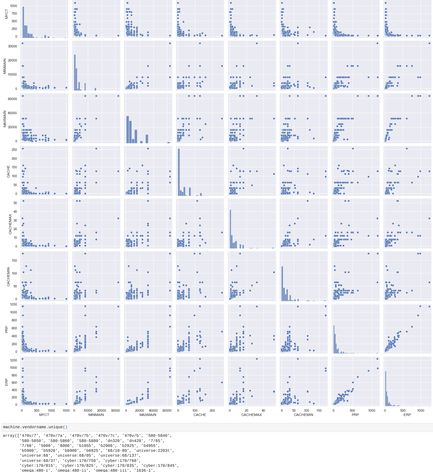


In [16]:
```
plt.scatter(machine.MYCT, machine.ERP)
```

Out[16]:
```
<matplotlib.collections.PathCollection at 0x1c0c252ed30>
```

In [17]:
```
sns.set(rc = {'figure.figsize':(15, 8)})
sns.pairplot(machine)
```

Out[17]:
```
<seaborn.axisgrid.PairGrid at 0x1c0c2b66e40>
```



In [18]:
```
machine.vendorname.unique()
```

Out[18]:
```
array(['470v/7', '470v/7a', '470v/7b', '470v/7c', '470v/5', '580-5840',
       '580-5842', '580-5844', '580-5846', 'sel32/', 'sel32/7',
       '7/16', '7/8MP', '7/8MP/', 'b1955', 'b2500', 'b2525', 'b4955',
       'b5000', 'b5000/', 'b5500', 'b5500/', '4/250', 'universe-2203',
       'universe-50', 'universe-80/05', 'universe-80/17',
       'universe-80/27', 'cyber:170/750', 'cyber:170/760',
       'cyber:170/825', 'cyber:170/835', 'cyber:170/845', 'cyber:170/845',
       'omega-480-i', 'omega-480-ii', 'omega-480-iii', '1636-1',
       '1636-10', '1641-1', '1641-11', '1651-1', 'decsys:10:1091',
       'decsys:20:2060', 'dec:2060', 'dec:2065', 'dec:2065/ii',
       'ecl:11/70', 'eclipse:c/350', 'eclipse:m/300', 'eclipse:mv/3000',
       'eclipse:mv/4000', 'eclipse:mv/5000', 'eclipse:mv/8000',
       'eclipse:mv/8000-1', 'f4000/100', 'f4000/200', 'f4000/200a',
       'f4000/300', 'f4000/300ap', '2000/150', 'concept:32/8705',
       'concept:32/8726', '3000/3', '3000/4', '3000/44', '3000/44/ii',
       '3000/44-', '3000/48', '3000/64', '3000/80', '3000/111', '100',
       '300', '500', '600', '700', '30', '800', 'dps:6/35', 'dps:6/92',
       'dps:6/92-1', 'dps:6/92-2', 'dps:6/92-3', 'dps:6/92-4',
       'dps:8/44', 'dps:8/49', 'dps:8/50', 'dps:8/51', 'dps:8/51/ii',
       'dps:8/20', '3033-s', '3033-u', '3081', '3081-d', '3083-b',
       '3083-e', '3083-j', '3083-j/ii', '3084', '3084-d', '3084-j',
       '3084/ii', '3085', '3085/ii', '3085-j', '3085-j/ii', '3085-k',
       '3085-k/ii', '3085-m', '3085-m/ii', '3085-n', '3085-n/ii',
       '3085-p', '3085-p/ii', '3085-q', '3085-q/ii', '3085-s',
       '3085-s/ii', '3085-u', '3085-u/ii', '3085-x', '3085-x/ii',
       '3085-y', '3085-y/ii', '3085-z', '3085-z/ii', '3085-ga',
       '3085-ga/ii', '3085-gb', '3085-gb/ii', '3085-gc', '3085-gc/ii',
       '3085-gd', '3085-gd/ii', '3085-ge', '3085-ge/ii', '3085-gf',
       '3085-gf/ii', '3085-gg', '3085-gg/ii', '3085-gh', '3085-gh/ii',
       '3085-gi', '3085-gi/ii', '3085-gj', '3085-gj/ii', '3085-gk',
       '3085-gk/ii', '3085-gl', '3085-gl/ii', '3085-gm', '3085-gm/ii',
       '3085-gn', '3085-gn/ii', '3085-go', '3085-go/ii', '3085-gp',
       '3085-gp/ii', '3085-gq', '3085-gq/ii', '3085-gr', '3085-gr/ii',
       '3085-gs', '3085-gs/ii', '3085-gt', '3085-gt/ii', '3085-gu',
       '3085-gu/ii', '3085-gv', '3085-gv/ii', '3085-gw', '3085-gw/ii',
       '3085-gx', '3085-gx/ii', '3085-gy', '3085-gy/ii', '3085-gz',
       '3085-gz/ii', '3085-ha', '3085-ha/ii', '3085-hb', '3085-hb/ii',
       '3085-hc', '3085-hc/ii', '3085-hd', '3085-hd/ii', '3085-he',
       '3085-he/ii', '3085-hf', '3085-hf/ii', '3085-hg', '3085-hg/ii',
       '3085-hh', '3085-hh/ii', '3085-hi', '3085-hi/ii', '3085-hj',
       '3085-hj/ii', '3085-hk', '3085-hk/ii', '3085-hl', '3085-hl/ii',
       '3085-hm', '3085-hm/ii', '3085-hn', '3085-hn/ii', '3085-ho',
       '3085-ho/ii', '3085-hp', '3085-hp/ii', '3085-hq', '3085-hq/ii',
       '3085-hr', '3085-hr/ii', '3085-hs', '3085-hs/ii', '3085-ht',
       '3085-ht/ii', '3085-hu', '3085-hu/ii', '3085-hv', '3085-hv/ii',
       '3085-hw', '3085-hw/ii', '3085-hx', '3085-hx/ii', '3085-hy',
       '3085-hy/ii', '3085-hz', '3085-hz/ii', '3085-ia', '3085-ia/ii',
       '3085-ib', '3085-ib/ii', '3085-ic', '3085-ic/ii', '3085-id',
       '3085-id/ii', '3085-ie', '3085-ie/ii', '3085-if', '3085-if/ii',
       '3085-ig', '3085-ig/ii', '3085-ih', '3085-ih/ii', '3085-ii',
       '3085-ii/ii', '3085-ij', '3085-ij/ii', '3085-ik', '3085-ik/ii',
       '3085-il', '3085-il/ii', '3085-im', '3085-im/ii', '3085-in',
       '3085-in/ii', '3085-io', '3085-io/ii', '3085-ip', '3085-ip/ii',
       '3085-iq', '3085-iq/ii', '3085-ir', '3085-ir/ii', '3085-is',
       '3085-is/ii', '3085-it', '3085-it/ii', '3085-iu', '3085-iu/ii',
       '3085-iv', '3085-iv/ii', '3085-iw', '3085-iw/ii', '3085-ix',
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       '3085-ja', '3085-ja/ii', '3085-jb', '3085-jb/ii', '3085-jc',
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       '3085-jp', '3085-jp/ii', '3085-jq', '3085-jq/ii', '3085-jr',
       '3085-jr/ii', '3085-js', '3085-js/ii', '3085-jt', '3085-jt/ii',
       '3085-ju', '3085-ju/ii', '3085-jv', '3085-jv/ii', '3085-jw',
       '3085-jw/ii', '3085-jx', '3085-jx/ii', '3085-jy', '3085-jy/ii',
       '3085-jz', '3085-jz/ii', '3085-ka', '3085-ka/ii', '3085-kb',
       '3085-kb/ii', '3085-kc', '3085-kc/ii', '3085-kd', '3085-kd/ii',
       '3085-ke', '3085-ke/ii', '3085-kf', '3085-kf/ii', '3085-kg',
       '3085-kg/ii', '3085-kh', '3085-kh/ii', '3085-ki', '3085-ki/ii',
       '3085-kj', '3085-kj/ii', '3085-kk', '3085-kk/ii', '3085-kl',
       '3085-kl/ii', '3085-km', '3085-km/ii', '3085-kn', '3085-kn/ii',
       '3085-ko', '3085-ko/ii', '3085-kp', '3085-kp/ii', '3085-kq',
       '3085-kq/ii', '3085-kr', '3085-kr/ii', '3085-ks', '3085-ks/ii',
       '3085-kt', '3085-kt/ii', '3085-ku', '3085-ku/ii', '3085-kv',
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       '3085-ld', '3085-ld/ii', '3085-le', '3085-le/ii', '3085-lf',
       '3085-lf/ii', '3085-lg', '3085-lg/ii', '3085-lh', '3085-lh/ii',
       '3085-li', '3085-li/ii', '3085-lj', '3085-lj/ii', '3085-lk',
       '3085-lk/ii', '3085-ll', '3085-ll/ii', '3085-lm', '3085-lm/ii',
       '3085-ln', '3085-ln/ii', '3085-lo', '3085-lo/ii', '3085-lp',
       '3085-lp/ii', '3085-lq', '3085-lq/ii', '3085-lr', '3085-lr/ii',
       '3085-ls', '3085-ls/ii', '3085-lt', '3085-lt/ii', '3085-lu',
       '3085-lu/ii', '3085-lv', '3085-lv/ii', '3085-lw', '3085-lw/ii',
       '3085-lx', '3085-lx/ii', '3085-ly', '3085-ly/ii', '3085-lz',
       '3085-lz/ii', '3085-ma', '3085-ma/ii', '3085-mb', '3085-mb/ii',
       '3085-mc', '3085-mc/ii', '3085-md', '3085-md/ii', '3085-me',
       '3085-me/ii', '3085-mf', '3085-mf/ii', '3085-mg', '3085-mg/ii',
       '3085-mh', '3085-mh/ii', '3085-mi', '3085-mi/ii', '3085-mj',
       '3085-mj/ii', '3085-mk', '3085-mk/ii', '3085-ml', '3085-ml/ii',
       '3085-mm', '3085-mm/ii', '3085-mn', '3085-mn/ii', '3085-mo',
       '3085-mo/ii', '3085-mp', '3085-mp/ii', '3085-mq', '3085-mq/ii',
       '3085-mr', '3085-mr/ii', '3085-ms', '3085-ms/ii', '3085-mt',
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       '3085-mw', '3085-mw/ii', '3085-mx', '3085-mx/ii', '3085-my',
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       '3085-nb', '3085-nb/ii', '3085-nc', '3085-nc/ii', '3085-nd',
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       '3085-oa', '3085-oa/ii', '3085-ob', '3085-ob/ii', '3085-oc',
       '3085-oc/ii', '3085-od', '3085-od/ii', '3085-oe', '3085-oe/ii',
       '3085-of', '3085-of/ii', '3085-og', '3085-og/ii', '3085-oh',
       '3085-oh/ii', '3085-oi', '3085-oi/ii', '3085-oj', '3085-oj/ii',
       '3085-ok', '3085-ok/ii', '3085-ol', '3085-ol/ii', '3085-om',
       '3085-om/ii', '3085-on', '3085-on/ii', '3085-oo', '3085-oo/ii',
       '3085-op', '3085-op/ii', '3085-oq', '3085-oq/ii', '3085-or',
       '3085-or/ii', '3085-os', '3085-os/ii', '3085-ot', '3085-ot/ii',
       '3085-ou', '3085-ou/ii', '3085-ov', '3085-ov/ii', '3085-ow',
       '3085-ow/ii', '3085-ox', '3085-ox/ii', '3085-oy', '3085-oy/ii',
       '3085-oz', '3085-oz/ii', '3085-pa', '3085-pa/ii', '3085-pb',
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       '3085-pg/ii', '3085-ph', '3085-ph/ii', '3085-pi', '3085-pi/ii',
       '3085-pj', '3085-pj/ii', '3085-pk', '3085-pk/ii', '3085-pl',
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       '3085-pv/ii', '3085-pw', '3085-pw/ii', '3085-px', '3085-px/ii',
       '3085-py', '3085-py/ii', '3085-pz', '3085-pz/ii', '3085-qa',
       '3085-qa/ii', '3085-qb', '3085-qb/ii', '3085-qc', '3085-qc/ii',
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