```
;********************
;;;;;;;;;;;;;;;;;;;;
;;; BENCH SETUP START
;;;;;;;;;;;;;;;;;;;;
;********************
        'setup_bench':begin

                                ; first check that the loops are open
           dtlp=SHOW('ao.dtlp',error=error,status=status,/notrace)
           IF dtlp NE 0 THEN BEGIN
              txt='Please open the loops before running setup bench'
              tmp=DIALOG_MESSAGE(txt)
              TQ,data,txt
              RETURN
           ENDIF

           IF data.rmag EQ 0 AND (data.archmode EQ 0 OR data.aoopsmode
NE 0) THEN BEGIN
              txt = 'Please enter a valid R magnitude (not mR=0) and
try again!'
              XMESSAGE, txt, 'OK', foo
              ABORT_ACQ,data
              RETURN
           ENDIF

           data.status[0:2] = [2,1,1]
           AOACQ_STATUS, data
           status = MODIFY('ao.frautabort', 0, err=err, /notrace) ;
clear abort flag

           IF data.aoopsmode EQ 2 THEN BEGIN
; set the auto offset to off
              WIDGET_CONTROL,data.but_id[6],set_val='Offset to
targ',set_uval='offset_target'

; set LGS to fixed
              data.lgsmode=0    ; (M3 fixed) ;; CRN checked, aofmmove
doesn't need changing for FST 20Apr2012
              tmp = MODIFY('ao.aofmmove', 0, stat=stat, err=err, /
notrace)
              tmp = MODIFY('ao.aolpmove', 0, stat=stat, err=err, /
notrace)
              WIDGET_CONTROL, data.drp_id[2],
set_droplist_select=data.lgsmode
              TQ,data,'Setting M3 to LGS FIXED'
           ENDIF

;;; Fill in structure containing parameters needed for bench setup
```

```
            setup = {obsdname: '', $
                     obamname: '', $
                     obasname: '', $
                     obwnname: '', $
                     obwfdsrc: 0L, $
                     obwpdsrc: 0L, $
                     fsmset: 1, $
                     tssset: 0, $
                     aofclgct: 0, $
                     aofcosoc: 1, $
                     aofctroc: 0, $
                     aotsgold: 0., $
                     guidwave: 0., $
                     wscnorfn: '', $
                     dtgain:   0.2, $
                     utgain:   0.1, $
                     dmgain:   0.3, $
                     dtsensor: 0, $
                     lsltlson: 0, $
                     aofotthr: 0., $
                     lst3pcrg: 0., $
                     stsetup:  0, $
                     obsi:     0., $
                     lbsetup:  0, $
                     aottmode: 0, $
                     aofomode: 0, $
                     lst3pcre: 0}   ;; CRN key on this k2 variable for
K1 FST even though it is changed to lspntrce

            case data.aoopsmode of
               0:begin
                  setup.obsdname = 'beamSplitter'
                  setup.obamname = 'mirror'
                  setup.obasname = 'ngs'
                  setup.obwnname = 'open'
                  setup.obwfdsrc = 0 ; manual
                  setup.obwpdsrc = 0 ; manual
                  setup.tssset = 0
                  setup.aofclgct = 0
                  setup.aofcosoc = 1 ; one shot mode
                  setup.aofctroc = 0
                  setup.aotsgold = 1.
                  setup.guidwave = 0.63e-6
                  setup.dtgain = 0.30
                  setup.dmgain = 0.50
                  setup.utgain = 0.00
                  setup.dtsensor = 0
                  setup.lsltlson = 0
                  setup.aofotthr = 20.0
                  setup.lst3pcrg = 0
```

```
                  setup.stsetup = 0
                  setup.obsi = 0
                  setup.lbsetup = 0
                  setup.aottmode = 1
                  setup.aofomode = 1
                  setup.lst3pcre = 0
               end

               1:begin
                  obsdnames = ['sodiumDichroic','beamSplitter']
                  XMESSAGE, 'Choose SOD optic:', obsdnames, aotsgold
                  setup.obsdname = obsdnames[aotsgold]
                  setup.obamname = 'mirror'
                  setup.obasname = 'ngs'
                  setup.obwnname = 'open'
                  setup.obwfdsrc = 0 ; manual
                  setup.obwpdsrc = 0 ; manual
                  setup.tssset = 1
                  setup.aofclgct = 0
                  setup.aofcosoc = 1 ; one shot mode
                  setup.aofctroc = 0
                  setup.aotsgold = FLOAT(aotsgold)
                  setup.guidwave = 0.68e-6
                  setup.dtgain = 0.2
                  setup.dmgain = 0.5
                  setup.utgain = 0.0
                  setup.dtsensor = 1
                  setup.lsltlson = 0
                  setup.aofotthr = 20.0
                  setup.lst3pcrg = 0
                  setup.stsetup = 1
                  setup.obsi = -1.5
                  setup.lbsetup = 1
                  setup.aottmode = 1
                  setup.aofomode = 1
                  setup.lst3pcre = 0
               end

               2:begin
                  setup.obsdname = 'sodiumDichroic'
                  setup.obamname = 'mirror'
                  setup.obasname = 'ngs'
                  setup.obwnname = 'open'
                  setup.obwfdsrc = 2 ; tracking
;; SCE. Adapted for CLS from K1FST
;;                  IF data.telescope EQ 'Keck I' THEN
                  setup.obwpdsrc = 0
;;                  ELSE setup.obwpdsrc = 2
;;                  ; tracking for KeckII  CRN make this 0 for keck I,
SC might not have tracking WPS !!! 03may2012
```

```
; SR uncommented the following set of the setup commands
                setup.tssset = 1
                setup.aofclgct = 1
                setup.aofcosoc = 0
                setup.aofctroc = 1 ; tracking mode
                setup.aotsgold = 0.
                setup.guidwave = 0.68e-6
                setup.dtgain = 0.2
                setup.utgain = 0.10
                setup.dmgain = 0.40
                setup.dtsensor = 1
                setup.lsltlson = 1
                setup.aofotthr = 20.
                setup.lst3pcrg = data.lst3pcrg
                setup.stsetup = 1
                setup.obsi = -1.5
                setup.lbsetup = 1
                setup.aottmode = 1
                setup.aofomode = 0
                setup.lst3pcre = 1
             end
          endcase

          data.obsdname=setup.obsdname

          dev = REPLICATE({root:'', name:'', slew:0B}, 7)
          dev.root = ['obsd', 'obam', 'obas', 'obfm', 'obts', 'obts',
'obwn']   ;replaced obsi with obts for temp K1 fix since sfd is
currently inop
          dev.name = ['sod', 'afm', 'afs', 'fsm', 'tss', 'sfd',
'wnd']
          dtsensors = ['WFS','STRAP']

;;; Let 'er rip!
          TQ, data, 'Opening all loops'
;; SCE. Adapted for CLS from K1FST
;;           CASE data.telescope OF
;;              'Keck I':  loops = ['ao.aoloop',
'ao.utlp','ao.aottmode', 'ao.aofomode','ao.lspntrce'] ;; CRN for FST
;;              ELSE: loops = ['ao.aoloop', 'ao.utlp','ao.aottmode',
'ao.aofomode', 'ao.lst3pcre']
;;           ENDCASE
          loops = ['ao.aoloop', 'ao.utlp','ao.aottmode',
'ao.aofomode','ao.lspntrce'] ;; Used for k1 and k2

          FOR n=0,N_ELEMENTS(loops)-1 DO status =
MODIFY(loops[n],0,err=err,/notrace)

;; for "LASER ZENITH" set rotator to proper VA
          IF ( data.aoopsmode eq 2 && data.tname eq "LASER ZENITH" )
```

```
then begin
             ; Move rotator to VA=116.6
             rotdest = SHOW('dcs.rotdest',stat=stat,err=err,/notr)
             rotmode = SHOW('dcs.rotmode',stat=stat,err=err,/notr)
;; SCE. Adapted for CLS from K1FST
;             CASE data.telescope OF
;              'Keck I':begin
                 if (ABS(rotdest/!dtor- 0.0) gt 0.1) or (rotmode ne 2)
then begin
                   TQ, data, 'Setting rotator to VA=0.0'
                   tmp = MODIFY('dcs.rotdest',0.0*!dtor,stat=stat, $
                                err=err, /notr)
                   tmp = MODIFY('dcs.rotmode',2,stat=stat,err=err,/
notr)
                   ;dev[7].slew = 1
                 endif
;;              endcase
;;              else:begin
;;                 if (ABS(rotdest/!dtor-116.6) gt 0.1) or (rotmode ne
2) then begin
;;                   TQ, data, 'Setting rotator to VA=116.6'
;;                   tmp = MODIFY('dcs.rotdest',116.6*!dtor,stat=stat,
$
;;                                err=err, /notr)
;;                   tmp = MODIFY('dcs.rotmode',2,stat=stat,err=err,/
notr)
;;                   ;dev[7].slew = 1
;;                 endif
;;               end
;;             endcase
           ENDIF

;; turn telemetry recording on if not already on
           trsrec=SHOW('ao.trsrec',/nowait,/notrace)
           IF data.simulate EQ 0 AND trsrec NE 7 THEN
status=MODIFY('ao.trsrec',7,error=error,/notrace)

;; for all modes:
           ;;set TT reference name on instrument
           TQ, data, 'Set AO ref. name for science inst.'
           ;; clean up *'s in target name (kwd compatibility)
           starpos = strpos(data.tname, '*')
           WHILE starpos NE -1 do begin
              tmp = data.tname
              strput, tmp, ' ', starpos
              data.tname = tmp
              starpos = strpos(data.tname, '*')
           ENDWHILE

           IF data.instname EQ 'NIRC2' then begin
```

```
            TQ, data, 'update object name...'
            TQ, data, 'Connecting to nirc2server to'
            SPAWN, 'rsh waikoko -l nirc2eng object
'+STRING(data.tname), tmp
         ENDIF

         tmp = MODIFY('ao.obptname', STRING(data.tname),
stat=stat,err=err,/notrace)

         ;; reset LBWFS decount and LBWFS RMS WF
         tmp = MODIFY('ao.lbtmtocp', 0., status=status, error=err, /
notrace)
         tmp =  MODIFY('ao.lgrmswf', 300.0, status=status,
error=err, /notrace)

         obsdname = SHOW('ao.obsdname', stat=stat, err=err, /
notrace)
         IF (obsdname NE setup.obsdname) THEN BEGIN
            TQ, data, 'Installing SOD ' + setup.obsdname
            tmp =
MODIFY('ao.obsdname',setup.obsdname,stat=stat,err=err,/notrace)
            dev[0].slew = 1
         ENDIF

         obamname = SHOW('ao.obamname', stat=stat, err=err, /
notrace)
         IF (obamname NE setup.obamname) THEN BEGIN
            TQ, data, 'Installing AFM ' + setup.obamname
            tmp =
MODIFY('ao.obamname',setup.obamname,stat=stat,err=err,/notrace)
            dev[1].slew = 1
         ENDIF

         obasname = SHOW('ao.obasname', stat=stat, err=err, /
notrace)
         IF (obasname NE setup.obasname) THEN BEGIN
            TQ, data, 'Moving AFS to named position ' +
setup.obasname
            tmp =
MODIFY('ao.obasname',setup.obasname,stat=stat,err=err,/notrace)
            dev[2].slew = 1
         ENDIF


; Close the WYKO shutter if not in simulate mode
;          ifwystat=SHOW('ao.ifwystat', status=status, error=err,/
notrace) ; 1=closed, 2=open
;          CASE ifwystat OF
;             1: TQ,data, 'Wyko shutter is closed'
;             ELSE: BEGIN
```

```
;                TQ,data, 'Wyko shutter is not closed'
;                IF NOT data.simulate THEN BEGIN
;                   TQ,data, 'Closing Wyko shutter'
;                   tmp=MODIFY('ao.ifwyshtr', 0, status=status,
error=err, /notrace) ; closed=0, open=1 !
;                ENDIF
;             END
;          ENDCASE

; -- Liz here, 11/6/12 :
; Close the WYKO shutter if not in simulate mode
;
           aowykoshsts=SHOW('ao.aowykoshsts', status=status,
error=err,/notrace)
;                (readback: 0:invalid, 1:open, 2:closed, 3:moving)
;
           CASE aowykoshsts OF
              2: TQ,data, 'Wyko shutter is closed'
              ELSE: BEGIN
                 TQ,data, 'Wyko shutter is not closed'
                 IF NOT data.simulate THEN BEGIN
                    TQ,data, 'Closing Wyko shutter'
;
;                     Command action: 0: Open, 1:close
;
                    tmp=MODIFY('ao.aowykoshcmd', 1, status=status,
error=err, /notrace)
                 ENDIF
              END
           ENDCASE

           TQ, data, 'Configuring focus manager'
           tmp = MODIFY('ao.aofcosoc', setup.aofcosoc, stat=stat,
err=err, /notrace)
           tmp = MODIFY('ao.aofctroc', setup.aofctroc, stat=stat,
err=err, /notrace)
           tmp = MODIFY('ao.aofcngct', 1, stat=stat, err=err, /
notrace)
           tmp = MODIFY('ao.aofclgct', setup.aofclgct,
stat=stat,err=err,/notrace)
           tmp = MODIFY('ao.aofclbct', 0, stat=stat, err=err, /
notrace)

           obwfdsrc = SHOW('ao.obwfdsrc', stat=stat, err=err, /
notrace)
           IF (obwfdsrc NE setup.obwfdsrc) THEN BEGIN
              TQ, data, 'Switching FCS to tracking or manual'
              tmp = MODIFY('ao.obwfdsrc',setup.obwfdsrc , stat=stat,
err=err, /notrace)
              tmp = MODIFY('ao.obwfmove', 1, stat=stat, err=err, /
```

```
notrace)
           ENDIF

; set FCS C0
; make sure that right '-N' or '-L' or '' is loaded
           CASE setup.obsdname OF
              'sodiumDichroic': suffix='-L'
               ELSE: suffix='-N'
           ENDCASE

; set the FSMs for the instrument
           path2cal='/kroot/rel/ao/qfix/data/'
           fname = path2cal+'fsm_origin.dat'
           fname_inst = fname+STRING(data.instname+suffix)
           MESSAGE,/INFO,'Copying '+fname_inst+' to '+fname
           SPAWN, '\cp -p '+fname_inst+' '+fname, foo
           LOADFSMORI


; set the offsets for the sodium or beamsplitter
; these values were derived experimentally as to where the best focus
of the FCS appears to be on the sky (for some unexplained reason, this
differs from the calibrated value). We don't know whether we have this
problem on Keck I or not. If we ever fix this problem, then the
offsets should be removed.
;; SCE. Adapted for CLS from K1FST
; S. Ragland uncommented the fcs offsets for Keck II
           CASE data.telescope OF
              'Keck II': BEGIN
                 CASE suffix OF
                    '-L': aofcc0so=-0.7
                    '-N': aofcc0so=-0.4
                 ENDCASE
                 IF data.simulate THEN aofcc0so=0.
                 status=MODIFY('ao.aofcc0so',FLOAT(aofcc0so),/notrace)
                 TQ,data,'Setting SOD FCS offset to
'+STRING(aofcc0so,format='(f5.2)')
              END
              ELSE: begin
                 CASE suffix OF
                    '-L': aofcc0so=0
                    '-N': aofcc0so=0
                 ENDCASE
                 IF data.simulate THEN aofcc0so=0.
                 status=MODIFY('ao.aofcc0so',FLOAT(aofcc0so),/notrace)
                 TQ,data,'Setting SOD FCS offset to
'+STRING(aofcc0so,format='(f5.2)')
              END
           ENDCASE
```

```
           TQ,data,'Setting FCS C0 for '+data.instname+suffix
           status=SET_FCS_FOR_INST(data.instname+suffix)

           obwpdsrc = SHOW('ao.obwpdsrc', stat=stat, err=err, /
notrace)
           IF (obwpdsrc NE setup.obwpdsrc) THEN BEGIN
              TQ, data, 'Switching WPS to tracking or manual'
              tmp = MODIFY('ao.obwpdsrc', setup.obwpdsrc , stat=stat,
err=err, /notrace)
              tmp = MODIFY('ao.obwpmove', 1 , stat=stat, err=err, /
notrace)
           ENDIF

           IF data.aoopsmode NE 2 THEN temp=MODIFY('ao.obwpname',
'ngs', error=error,/notrace)

           IF data.darmode ge 0 THEN BEGIN
              TQ, data, 'Setting up DAR'
              tmp = MODIFY('dcs.guidwave',
setup.guidwave,stat=stat,err=err,/notrace)
              tmp = MODIFY('ao.aodrzsim', 1.0, stat=stat, err=err, /
notrace)
              tmp = MODIFY('ao.aodrena', 1.0, stat=stat, err=err, /
notrace)
              tmp = MODIFY('ao.aotfenb', 1, stat=stat, err=err, /
notrace) ;TSSfoc
           endif

           ;;; set up tss gold numbers
           aotsbsg = NAMEDPOSN(dev='tss', name='optbsstrap')
           aotssdg = NAMEDPOSN(dev='tss', name='optsodstrap')

           tmp = MODIFY('ao.aotsbsgx', -1*aotsbsg[0], stat=stat,
err=err, /notrace)
           tmp = MODIFY('ao.aotsbsgy', -1*aotsbsg[1], stat=stat,
err=err, /notrace)
           tmp = MODIFY('ao.aotsbsgz', -1*aotsbsg[2], stat=stat,
err=err, /notrace)
           tmp = MODIFY('ao.aotssdgx', -1*aotssdg[0], stat=stat,
err=err, /notrace)
           tmp = MODIFY('ao.aotssdgy', -1*aotssdg[1], stat=stat,
err=err, /notrace)
           tmp = MODIFY('ao.aotssdgz', -1*aotssdg[2], stat=stat,
err=err, /notrace)
           tmp = MODIFY('ao.aotsgold', setup.aotsgold,
stat=stat,err=err,/notrace)

;******************
; Branch on off axis logic, RDC, Feb 2012
;******************
```

```
           if (data.offAxisFlag) then begin
              getTTpnt,data
              if (setup.tssSet) then begin
;******************
; LGS mode: TSS to TT star offset coordinates,
;           FSM to poining ref (typically sci camera)
;******************
                aots = data.pntTTcur
                obsdname = SHOW('ao.obsdname', stat=stat, err=err, /
notrace)
                IF obsdname EQ 'sodiumDichroic' then $
                  obtsz = NAMEDPOSN(dev='tss', name='optsodstrap',
axis='z') else $
                     obtsz = NAMEDPOSN(dev='tss', name='optbsstrap',
axis='z')
                txt = 'Moving TSS to ' + $
                       STRING([aots,obtsz],f='(" X=",F7.3," Y=",F7.3,"
Z=",F6.3)')
                TQ, data, txt

                tmp = MODIFY('ao.aotsx', aots[0]*1e-3, stat=stat,
err=err, /notrace)
                tmp = MODIFY('ao.aotsy', aots[1]*1e-3, stat=stat,
err=err, /notrace)
                tmp = MODIFY('ao.aotsgo', 1, stat=stat, err=err, /
notrace)
                dev[4].slew = 1

                aofm = data.pntrefcur
                txt = 'Moving FSMs to ' + STRING(aofm,f='(" X=",F6.3,"
Y=",F6.3)')
                TQ, data, txt
                tmp = MODIFY('ao.aofmx', aofm[0]*1e-3, stat=stat,
err=err, /notrace)
                tmp = MODIFY('ao.aofmy', aofm[1]*1e-3, stat=stat,
err=err, /notrace)
                tmp = MODIFY('ao.aofmgo', 1, stat=stat, err=err, /
notrace)
                dev[3].slew = 1
              endif  else begin
;******************
; NGS mode, Move only FSMs to TT location
;******************
                aofm = data.pntTTcur
                txt = 'Moving FSMs to ' + STRING(aofm,f='(" X=",F6.3,"
Y=",F6.3)')
                TQ, data, txt
                tmp = MODIFY('ao.aofmx', aofm[0]*1e-3, stat=stat,
err=err, /notrace)
                tmp = MODIFY('ao.aofmy', aofm[1]*1e-3, stat=stat,
```

```
err=err, /notrace)
                tmp = MODIFY('ao.aofmgo', 1, stat=stat, err=err, /
notrace)
                dev[3].slew = 1
              endelse
;******************
;ON axis mode (same as before) RDC Feb 2012
;Moving FSM's to PO (note that fsmset is always true)
;******************
           endif else begin

           IF (setup.fsmset EQ 1) THEN BEGIN
              aofm = data.pntrefcur
              txt = 'Moving FSMs to ' + STRING(aofm,f='(" X=",F6.3,"
Y=",F6.3)')
              TQ, data, txt
              tmp = MODIFY('ao.aofmx', aofm[0]*1e-3, stat=stat,
err=err, /notrace)
              tmp = MODIFY('ao.aofmy', aofm[1]*1e-3, stat=stat,
err=err, /notrace)
              tmp = MODIFY('ao.aofmgo', 1, stat=stat, err=err, /
notrace)
              dev[3].slew = 1
           ENDIF

           IF (setup.tssset EQ 1) THEN BEGIN
              aots = data.pntrefcur
              obsdname = SHOW('ao.obsdname', stat=stat, err=err, /
notrace)
              IF obsdname EQ 'sodiumDichroic' then $
                 obtsz = NAMEDPOSN(dev='tss', name='optsodstrap',
axis='z') else $
                    obtsz = NAMEDPOSN(dev='tss', name='optbsstrap',
axis='z')
              txt = 'Moving TSS to ' + $
                    STRING([aots,obtsz],f='(" X=",F6.3," Y=",F6.3,"
Z=",F6.3)')
              TQ, data, txt

              tmp = MODIFY('ao.aotsx', aots[0]*1e-3, stat=stat,
err=err, /notrace)
              tmp = MODIFY('ao.aotsy', aots[1]*1e-3, stat=stat,
err=err, /notrace)
              tmp = MODIFY('ao.aotsgo', 1, stat=stat, err=err, /
notrace)

              dev[4].slew = 1
           ENDIF
          endelse
```

```
;;           IF data.telescope EQ 'Keck II' THEN BEGIN
              lsltlson = SHOW('ao.lsltlson', stat=stat, err=err, /
notrace)
              IF (lsltlson NE setup.lsltlson) THEN BEGIN
                 TQ, data, 'Switching LTCS laser configuration ' +
dtsensors[setup.dtsensor]
                 tmp = MODIFY('ao.lsltlson',
setup.lsltlson,stat=stat,err=err,/notrace)
              ENDIF
;;           ENDIF

           IF (setup.aofotthr NE 0.) THEN BEGIN
              aofotthr = SHOW('ao.aofotthr', stat=stat, err=err, /
notrace)
              IF aofotthr NE setup.aofotthr THEN BEGIN
                 TQ, data, 'Setting WFO period to
'+STRTRIM(setup.aofotthr,2) + 's'
                 tmp =
MODIFY('ao.aofotthr',setup.aofotthr,stat=stat,err=err,/notrace)
              ENDIF
           ENDIF

;; SCE. Adapted for CLS from K1FST
           IF (setup.lst3pcrg NE 0.) THEN BEGIN
;;              IF data.telescope EQ 'Keck II' THEN BEGIN
;;                 TQ, data, 'Configuring M3 integrator'
;;                 tmp =
MODIFY('ao.lst3pcrg',setup.lst3pcrg,stat=stat,err=err,/notrace)
;;                 tmp = MODIFY('ao.lst3pcri',1,stat=stat,err=err,/
notrace) ; zero it
;;              ENDIF ELSE BEGIN
                 TQ, data, 'Configuring M2-M5 integrator'  ;; CRN
changes for FST just zero, leave gain as set by FST system startup
                 tmp = MODIFY('ao.lspntrci',1,stat=stat,err=err,/
notrace) ; zero integrator
;;              ENDELSE
           ENDIF

           dtsensor = SHOW('ao.dtsensor', stat=stat, err=err, /
notrace)
           IF (dtsensor NE setup.dtsensor) THEN BEGIN
              TQ, data, 'Switching DT sensor to ' +
dtsensors[setup.dtsensor]
              tmp = MODIFY('ao.dtsensor',
setup.dtsensor,stat=stat,err=err,/notrace)
              WAIT,1
           ENDIF

           data.setuprmag=data.rmag
; determine the STRAP and WFS equivalent magnitudes
```

```
data.wfsrmag=EFFECTIVERMAG(data.rmag,aoopsmode=data.aoopsmode,obsdname
=data.obsdname)

data.straprmag=EFFECTIVERMAG(data.rmag,aoopsmode=data.aoopsmode,obsdna
me=data.obsdname,/strap)

           IF (setup.stsetup EQ 1) THEN BEGIN
              TQ, data, 'Setting STRAP for effective
mR='+STRTRIM(STRING(data.straprmag,f='(F5.1)'),2)
              SETUP_STRAP, data.straprmag, status=status
              IF status EQ -1 THEN BEGIN
                 tmp=DIALOG_MESSAGE('Strap settings not defined for
this magnitude',/error)
                 TQ,data,'Strap settings not defined for this
magnitude'
                 data.status[0:2] = [1,1,1]
                 AOACQ_STATUS, data
                 RETURN
              ENDIF
           ENDIF ELSE BEGIN
                 ststate = SHOW('ao.ststate', stat=stat, err=err, /
notrace)
                 IF ststate NE 0 then tmp = MODIFY('ao.ststby', 1,
stat=stat, err=err, /notrace)
                 obswname = SHOW('ao.obswname', stat=stat, err=err, /
notrace)
                 IF (obswname NE 'BLOCK') then tmp =
MODIFY('ao.obswname', 'block', stat=stat, err=err, /notrace)

           ENDELSE

           IF (setup.obsi NE 0.) THEN BEGIN
              obsi = SHOW('ao.obsi', stat=stat, err=err, /notrace)*1e3
              IF (ABS(obsi-setup.obsi) gt 0.01) THEN BEGIN
                 tmp = MODIFY('ao.obsi', setup.obsi*1e-3,
stat=stat,err=err,/notrace)
                 dev[5].slew = 1
              ENDIF
           ENDIF

           TQ, data, 'Halting LBWFS'
           tmp = MODIFY('ao.aolbloop', 0, stat=stat, err=err, /
notrace)
           tmp = MODIFY('ao.aolblpstr', 'Halted' , stat=stat,
err=err, /notrace)
           tmp = MODIFY('ao.lblpnfra', 0, stat=stat, err=err, /
notrace)
           tmp = MODIFY('ao.aolbsvcg', 0, stat=stat, err=err, /
notrace)
```

```
           tmp = MODIFY('ao.aofclbct', 0, stat=stat, err=err, /
notrace)
           tmp = MODIFY('ao.lbtmtocp', 0., status=status, error=err, /
notrace)

           txt = 'Closing TTO'
           IF (setup.aofomode EQ 1) then txt = txt + ', WFO'
;; SCE. Adapted for CLS from K1FST
           IF (setup.lst3pcre EQ 1) then txt = txt + ', M2-M5' ;; CRN
for FST
;;           CASE data.telescope OF
;;              'Keck I':  IF (setup.lst3pcre EQ 1) then txt = txt +
', M2-M5' ;; CRN for FST
;;              ELSE: IF (setup.lst3pcre EQ 1) then txt = txt + ', M3'
;;           ENDCASE

           TQ, data, txt + ' offload loops'
           tmp = MODIFY('ao.aottmode', setup.aottmode, stat=stat,
err=err, /notrace)
           IF (setup.aofomode NE 0) then $
              tmp = MODIFY('ao.aofomode', setup.aofomode,
stat=stat,err=err,/notrace)
           IF (setup.lst3pcre NE 0) then begin
;; SCE. Adapted for CLS from K1FST
              tmp = MODIFY('ao.lspntrce', setup.lst3pcre,
stat=stat,err=err,/notrace)  ;; CRN for FST
;;              CASE data.telescope OF
;;                 'Keck I': tmp = MODIFY('ao.lspntrce',
setup.lst3pcre, stat=stat,err=err,/notrace)  ;; CRN for FST
;;                 ELSE: tmp = MODIFY('ao.lst3pcre', setup.lst3pcre,
stat=stat,err=err,/notrace)
;;              ENDCASE

           ENDIF
           WHILE (MAX(dev.slew) EQ 1) do begin
              idx = WHERE(dev.slew EQ 1, ns)
              fmt = '(' + STRTRIM(ns,2) + '(A,X))'
              TQ, data, 'Waiting for ' + STRING(dev[idx].name,f=fmt)
              AOACQ_PLOT, data
              WAIT,2
              for i=0,ns-1 do begin
                 stst =
SHOW('ao.'+dev[idx[i]].root+'stst',stat=stat,err=err,/notrace)
                 dev[idx[i]].slew = (stst NE 'INPOS')
              endfor
           ENDWHILE

           recapsmt='236'       ; can make this telescope/plate scale
dependent
           status=MODIFY('ao.recapsmt',recapsmt,/notrace)
```

```
; turn off DTT and UTT dithering
           dtdst=SHOW('ao.dtdst',/notrace,/nowait)
           IF dtdst EQ 1 THEN status=MODIFY('ao.dtdst',0,error=error,/
notrace)

           utdst=SHOW('ao.utdst',/notrace,/nowait)
           IF utdst EQ 1 THEN status=MODIFY('ao.utdst',0,error=error,/
notrace)

; if loading a saved configuration, we are all done
           IF data.archmode NE 0 THEN RETURN

; set up the servos, gains
           status=MODIFY('ao.dtservo',[1D,0,0,0,-1,0,0],error=error,/
notrace)
           status=MODIFY('ao.utservo',[1D,0,0,0,-1,0,0],error=error,/
notrace)
           status=MODIFY('ao.dmservo',
[1D,0,0,0,-0.99,0,0],error=error,/notrace)
           status=MODIFY('ao.dtclp',1,error=error,/notrace) ; close
the DTT CLMP loop
;; SCE. Adapted for CLS from K1FST
;;           IF data.telescope EQ 'Keck II' THEN BEGIN
;;              status=MODIFY('ao.utclp',0,error=error,/notrace) ;
open the UTT CLMP loop
;;           ENDIF ELSE BEGIN
             status=MODIFY('ao.utclp',1,error=error,/notrace) ; close
the UTT CLMP loop CRN FST change 20Apr2012
;;           ENDELSE
           status=MODIFY('ao.dtgain',setup.dtgain,error=error,/
notrace)
           status=MODIFY('ao.dmgain',setup.dmgain,error=error,/
notrace)
           status=MODIFY('ao.utgain',setup.utgain,error=error,/
notrace)

           IF data.aoopsmode EQ 2 THEN BEGIN
              obpsxfs=0
              SETFRAMERATE,data.lgsfrrt,prog=2

              obwnname = SHOW('ao.obwnname', stat=stat, err=err, /
notrace)
              IF (obwnname NE setup.obwnname) THEN BEGIN
                 TQ, data, 'Moving WND to named position ' +
setup.obwnname
                 tmp =
MODIFY('ao.obwnname',setup.obwnname,stat=stat,err=err,/notrace)
                 dev[6].slew = 1
              ENDIF
```

```
            binning=2
            prefix='24'
            data.guidestar='LGS'
            WIDGET_CONTROL,data.drp_id[20],set_val='LGS'
         ENDIF ELSE BEGIN

; need to set the plate scale here depending on the observation
            IF data.instname EQ 'IF' or data.instname EQ 'ASTRA' or
data.instname EQ 'OHANA' THEN BEGIN
               obpsxfs=SHOW('ao.obpsxfs',error=error,status=status,/
notrace)
               IF obpsxfs EQ 3 THEN binning=1 ELSE binning=2

               wssmbin=SHOW('ao.wssmbin',error=error,status=status,/
notrace)
               IF wssmbin NE binning THEN BEGIN
                  TQ,data, 'Changing binning mode'

wsfrrt=SHOW('ao.wsfrrt',error=error,status=status,/notrace)
                  SETFRAMERATE,wsfrrt,binning=binning
               ENDIF

            ENDIF ELSE BEGIN  ; could set different plate scales for
different objects
               obpsxfs=0
            ENDELSE

; Determine what the AO settings should be as a function of magnitude
            TQ,data,'Setting WFS for effective
mR='+STRTRIM(STRING(data.wfsrmag,f='(F5.1)'),2)
            data.watao = SETNGSAO_VMAG(data.wfsrmag,bkgnd=wfbkgnd) ;
watao (what AO settings?) variable traces the status of the AO config
            data.wfbkgnd=wfbkgnd

            IF (data.watao EQ -1) THEN BEGIN
               txt = '****Warning****                \' + $
                     ' The AO settings are wrong     \' + $
                     ' Check the Rmag and B-Vmag     \'
               XMESSAGE,txt,['OK'],retval
               RETURN
            ENDIF

            obpsxfs=SHOW('ao.obpsxfs',error=error,status=status,/
notrace)

            CASE obpsxfs OF
               2:  prefix='10'
               3:  prefix='06'
               ELSE: prefix='24'
```

```
              ENDCASE

              binning=SHOW('ao.wssmbin',error=error,status=status,/
notrace)
              IF status LT 0 THEN BEGIN
                 MESSAGE,/INFO,'Cannot read the binning keyword,
ao.wssmbin'
                 TQ,data,'Cannot read the binning keyword, ao.wssmbin'
                 binning=2
              ENDIF
           ENDELSE

           status=MODIFY('ao.obpsxfs',obpsxfs,/notrace)
           WAIT,0.20
           TQ,data,'Setting up the lenslet config'
           WFSCONFIG

; update the centroid gain
           UPDATE_CENTROID_GAIN,data

           binning=STRING(binning,format='(i1)')
           binstring=binning+'x'+binning
           cogfn=prefix+data.instname+suffix+binstring+'.cog'
           TQ,data,'Loading cog file '+cogfn
           LOADCOG,cogfn

           data.status[0:2] = [3,1,1]
           AOACQ_STATUS, data
           TQ, data, 'Bench setup done'
           WIDGET_CONTROL,event.top,set_uvalue=data
        end

        'setup_bench_help':begin
           txt = 'SETUP BENCH\' + $
                 '                                                  \'
+ $
                 '[only some AO modes]\' + $
                 '1) open all loops.                                \'
+ $
                 '2) set SOD, AFM, AFS, [TSS].                      \'
+ $
                 '3) switch FCS, WPS to tracking.                   \'
+ $
                 '4) Configure focus manager.                       \'
+ $
                 '5) Configure DAR.                                 \'
+ $
                 '6) Send FSMs to reference position.               \'
+ $
                 '7) [Send TSS to reference position.]              \'
```

```
+ $
                '8) Load default cog file.                          \'
+ $
                '9) Set appropriate reconstructor & gains.          \'
+ $
                '10) Set dtsensor.                                  \'
+ $
                '11) [Reset FO period to 20s.]                      \'
+ $
                '12) [Setup and zero M3 integrator.]                \'
+ $
                '13) [Setup STRAP and LBWFS.]                       \'
+ $
                '14) Close TTO, [WFO, M3] offload loops.            \'
+ $
                '15) Wait for stages to finish slewing.             '
           XMESSAGE, txt, 'OK', foo
        end
```