
TruSpec® CHN/CHNS Micro Carbon/Hydrogen/Nitrogen/Sulfur Determinators Instruction Manual

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DUfhBi a VYf &\$\$! +%* ·
>i `m&\$%) ·

DUHÝbhg UfY DYbXjb[]b l "G"5" UbX chYf Vt bHf]Yg ·

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Minor revisions may not be reflected in this manual.



Delivering the Right Results ·

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Quality at LECO Corporation means understanding our customer's requirements and establishing specifications that clearly define those requirements. The essence of our quality philosophy is the commitment to quality objectives, aimed at never-ending improvement and complete customer satisfaction.

Safety Symbols

These symbols may be found on LECO equipment or their components. These symbols indicate the use of specific safety guidelines. Important safety information is highlighted in this manual by one of the following symbols as well as WARNING and CAUTION statements. Operator and service personnel must follow these instructions for personal safety and to prevent damage to the equipment.

The instrument should be operated only by technically qualified individuals who have fully read and understand these instructions. The instrument should be operated only in accordance with these instructions.

The operator should follow all of the warnings and cautions set forth in the manual and the operator should follow and employ all applicable standard laboratory safety procedures.



This symbol indicates a risk of electrical shock.



This symbol indicates a high temperature surface.



This symbol indicates a caution.



This symbol indicates an explosion potential.



This symbol indicates an Electrostatic Sensitive Device. Do not touch.



This symbol indicates a risk of personal injury or instrument damage.

Operating Precautions

The instrument should be operated only by technically qualified individuals who have fully read and understand these instructions. The instrument should be operated only in accordance with these instructions. The operator should follow all of the warnings and cautions set forth in the manual and the operator should follow and employ all applicable standard laboratory safety procedures.



Sensitive Electrical Components. LECO recommends disconnecting instrument power before performing service on any electrical components.



During installation and operation of this instrument, the ON/OFF switch must be easily accessible.



If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. Any other use is considered a misuse.



Maintenance and service is to be completed by a Responsible Body: a person who has the proper training and knowledge to perform the task safely.



Wear gloves and eye protection whenever handling glass tubes to prevent injury.



Visually inspect all glass tubing before installation or repacking. Do not use (and dispose of) any glass tubing that has cracks, chips or scarring. Damaged tubes could possibly rupture under pressure.

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Pegasus®

SmartLine® Remote Diagnostics

Spectrum System 1000®

TruMac®

TruSpec®

TruSpeed®

True Plasma Power®

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1

Introduction

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DfcXi W\GUZYhm-----%`E&\$
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&`-bghU`Uh\]cb-----%`E%
=``i ghfUh\]cbg-----%`E&
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-bghU`]b[`h\`Y`-bghfi a Ybh`-----%`E(
-bghU`]b[`h\`Y`7fi W\`V`Y`-----%`E,
DUW\]b[`h\`Y`FYU[Ybh\]hi VY`-----%`E%\$
-bghU`]b[`h\`Y`7ca di h\]f`-----%`E%&
8Uh\]HfUbga]h`-bghU`Uh\]cb`-----%`E%
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7Uff]Yf`; Ug`A Ub]Zc`X`DfYggi fY`GYh\]b[`-----%`E%)

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5X`1 gh]b[`h Y`H]a Yf`J U`j Y E(*
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(`GmghYa`GYh d E%
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GY`YWM]b[`U`@Ub[i U[Y E%*
8YhYfa]b]b[`I`gYf`DYfa]gg]cbg E%+
8]gd`Um`7cbZ] i fUh]cb E&%
GmghYa`7cbZ] i fUh]cb E' %
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8YZ]b]b[`7U`]VfUh]cb`GhUbXUfXg E()
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I gYf`8YZ]bYX` :]Y`Xg E* (
A UbU[]b[`8UhUVUgYg E* +
8Y`Yh]b[`5bU`mYX`GUa d`Yg E(,)

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@c[]b) E%&
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7cffYWh Zcf' 5ha cgd\Yf]W6`Ub_) E%+
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HfUbga]jh]b['8UhJ) E) +
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8UhJ'6UW_i d) E* *
HfUbga ZYf'=a dcfh') E* +
9ffcf' A YggU[Yg) E*,
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7`YUb]b['h Y' 7Ufcg gY) * E%\$
DUW_]b['h Y' 7ca Vi gh]cb 'Hi VY) * E%&
FYd`UW]b['h Y' 7fi WhY) * E%+
7`YUb]b['h Y' @cUX]b['<YUX) * E%-
DUW_]b['h Y' F YU[Ybh'Hi VY) * E&
C!f]b[g) * E&)
DUW_]b['h Y' FYXi Wh]cb <YUhYf'Hi VY) * E&*
7`YUb]b['h Y' GWhYYb :]hYf) * E&-
FYa cj]b['UbX'FYd`UW]b['h Y' 7ca Vi gh]cb 'Hi VY) * E' \$
@c[[]b['b' DYf]cX]WA U]bhYbUbW) * E' ()
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7cbZ[i f]b['A U]bhYbUbW' 7ci bhYfg) * E' *
FYgYh'A U]bhYbUbW' 7ci bhYfg) * E' ,

+ 'H\YcfmcZCdYfUh]cb' +\E%
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 A Yh\cX'cZGhUbXUfX'5XX]h]cbg +\E*
 6Ufc a Yhf]WDfYggi fY +\E+
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 =bZUfYX'FUX]Uh]cb'7Y +\E%\$
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 , '8]U[bcgh]W\j , \E%
 =`i ghfUh]cbg , \E&
 5a V]YbhAcb]hcf , \E'
 7U]VfUh]cbg , \E*
 BYh cf_ '8]U[bcgh]W\j , \E%\$
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 @YU_ '7\YW , \E%(
 GmghYa '7\YW , \E%
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 - 'GYfj]W\j - \E%
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 7cbZ][i f]b[':]fYk U`'GYh]b[g - \E%-
 7cbZ][i f]b['8<7D@hY - \E&\$
 FY[]ghYf]b['GcZhk UfY - \E&
 Hfc i VYg\cch]b['7cdmDfchYW\jcb' ?Ym - \E&,
 @cUX]b['<YUX'5'][ba Ybh'UbX'5X1 gha Ybh - \E-&
 7'YUb]b['h\Y'@cUX]b['<YUX' =bhYfZUW'6'cW - \E' &
 7Ufc i gY'5'][ba Ybh - \E' '
 FYa cj]b['UbX'GYfj]W\j b['h\Y'H7'7Y - \E')
 FYa cj]b['UbX'GYfj]W\j b['h\Y'�'7Y - \E' *
 =`8YhYf]cf '@bYUf]nUh]cb - \E' +
 =`7Y`GUh fUh]cb'Cdjh]a]nUh]cb - \E' -
 %\\$ =`i ghfUh]cbg %\\$ \E%
 %%GW Ya Uh]W\j %% \E%
 %& =bXYI %% \E%

Illustrations

:][i fY'&! %: UW]hmFYei]fYa Ybhg' &E+
:][i fY'&! &@UbW`=bghU`Uh]cb &E,
:][i fY'&! '7fi WYW`=bghU`Uh]cb &E-
:][i fY'&! ('FYU[YbhHi VY'DUW_]b[..... &E%
:][i fY'&!) '6chhca 'FY[i `Uhcf &E%*
:][i fY' !% 6U`UbW`7cbhfc`DUbY E*
:][i fY' !& '7Ufcg gY`CdYb`Dcg]h]cb E%&
:][i fY' !& '7Ufcg gY`6chhca `D`UhY E%&
:][i fY' !(& '7Ufcg gY`Aci bh]b['Dcg]h]cb E%
:][i fY' !) 'GhUW_YX`7Ufcg gY`g E%
:][i fY' !* 'Cl m[Yb[i fbUW`GWi VVYf E%
:][i fY' !+ '<YUh]b['9Ya Ybh`=bghU`Uh]cb E&\$
:][i fY' !, 'DUW_]b['h`Y[i fbUW`Hi VY E&&
:][i fY' !- 'GYUh]b['h`Y[i fbUW`Hi VY E&&
:][i fY' !%\$ '7C & @ '7Y`A Ub]Zc`X`UbX`@]bYg E&
:][i fY' !%\$ '7C & @ '7Y`* && \$%\$%& @bghU`YX E&(
:][i fY' !%& 'A Ub]Zc`X`6`cW E&(
:][i fY' !% &@]bY`Zfc`A Ub]Zc`X`6`cW`hc`7C & @ '7Y`A Ub]Zc`X E&)
:][i fY' !%('8]j YfhYf`J Uj Y`5ggYa V`m E&)
:][i fY' !% ' @]bY`hc`G]XY`Dcfh`cZ`8]j YfhYf`J Uj Y`5ggYa V`m E&*
:][i fY' !%* '7UhU`ngh<YUhYf`; Ug`7cbbYW]cb E&*
:][i fY' !%+ '8]j YfhYf`J Uj Y`; Ug`7cbbYW]cbg E&+
:][i fY' !% `; fci bX`GhUd E&+
:][i fY' !% '7UhU`ngh<YUhYf`; Ug`7cbbYW]cb E' \$
:][i fY' !%& 'Cl m[Yb`5XX! Cb`@bhyfZUW E' %
:][i fY' !%& @UbW`FYa c]U E' %
:][i fY' !& @bghU`@cUX`<YUX`@bhyfZUW`6`cW E' &
:][i fY' !& '8]j YfhYf`J Uj Y E' &
:][i fY' !& ('Cl m[Yb`7UhU`ngh<YUhYf`Hi VY'DUW_]b[..... E')
:][i fY' !&) '7cbhfc`g`UbX`@bX]W]hcf E' *
:][i fY' !*& 'GUa d`Y`DfYdUfUh]cb! A]WcW]dg`Y E' -
:][i fY' !& `; i fbUW`7cbhfc`7Ufx E()
:][i fY' !& 'H]a Yf`J Uj Y`5X`1 gha Ybh E(*)
:][i fY' !& 'H]a Yf`J Uj Y`5ggYa V`m E(+

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:][i fY' !' &`i fbUW`5ggYa V`mG\YYh`%`cZ- -----' È) \$
:][i fY' !' !' `i fbUW`5ggYa V`mG\YYh`&`cZ- -----' È) %
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:][i fY' !')`i fbUW`5ggYa V`mG\YYh`'cZ- -----' È) '
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:][i fY' !' +`i fbUW`5ggYa V`mG\YYh`*`cZ- -----' È))
:][i fY' !' ,`i fbUW`5ggYa V`mG\YYh`+`cZ- -----' È) *
:][i fY' !' -`i fbUW`5ggYa V`mG\YYh`'cZ- -----' È) +
:][i fY' !`(\$`i fbUW`5ggYa V`mG\YYh`-`cZ- -----' È) ,
:][i fY' !`(%`@UX]b['<YUX`5ggYa V`m"-----' È) -
:][i fY' !`(&`fcbh`DUbY`7ca d`YhY`5ggYa V`m"-----' È* \$
:][i fY' !`('`CI m[Yb`i fbUW`9I d`cXYX`J]Yk -----' È* %
:][i fY' !`((`F][\hG]XY`J]Yk È`8j]XYf`DUbY`FYa cj YX -----' È* &
:][i fY' !`(`F][\hG]XY`J]Yk -----' È*'
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:][i fY' (!%`fcbh`DUbY`7cbhfc`g`UbX`i bW]cbg -----' (È+
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:][i fY' !%`GUa d`Y`DfYdUfUh]cb` A]WcWldgi`Y -----') È%
:][i fY'*!%`Anhydron`Hi VY`DUW]b[-----'* È-
:][i fY'*!`&`7UfcgY`6chca`J]Yk -----'* È%\$
:][i fY'*!`'7UfcgY`6Yuf]b[g -----'* È%
:][i fY'*!`'7ca Vi gh]cb`Hi VY`DUW]b[`fA]WcÈ -----'* È%
:][i fY'*!)`5`hYfbUhY`7ca Vi gh]cb`Hi VY`DUW]b[`fA]WcÈ -----'* È%)
:][i fY'*!*`@UbW`5ggYa V]Yg -----'* È%*
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:][i fY'*!,`@UbW`FYa cj U -----'* È%
:][i fY'*!`-`G`]XY`6`cW`FYa cj U -----'* È&\$
:][i fY'*!`%`G`]XY`6`cW`fbcchca`J]Yk È -----'* È&\$
:][i fY'*!%`@UbW`G\]Y`X`UbX`@UbW`Hcc` -----'* È&%
:][i fY'*!`&`Ya U`Y>Uk`UbX`@UX]b[`D]b -----'* È&%
:][i fY'*!`%`FYU`Ybh`Hi VY`DUW]b[-----'* È&(
:][i fY'*!`%`FYXi W]cb`<YUhYf -----'* È&+
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:][i fY'*!% ': i fbUVW'@UhW'D]b***** * È' &
:][i fY'*!% '7ca Vi gh]cb': i fbUVW'5ggYa V'm***** * È' '
:][i fY'*!% 'TruSpec'A]Wc'A YUgi fYa Ybh: `ck '8]U[fUa ***** +È(
:][i fY'*!% 'DbYi a Uh]W: `ck '8]U[fUa ***** +È)
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:][i fY', !&'7<BGC': `ck '8]U[fUa ***** ; È%+
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:][i fY'*!% '@cUX]b['<YUX]b['5'][ba YbH =bhYfZUW'6`cW_***** - È' \$
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:][i fY'*!*'7UfcI gY'5')[ba Ybh***** - È' (
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:][i fY'*\$!' 'Hcd'DUbY'5ggYa V'm***** %\$È)
:][i fY'*\$!('H7'Cj Yb'5ggYa V'm***** %\$È*
:][i fY'*\$!) '<Y'ji a 'A Ub]Zc'X'FY[i 'Uhcf'5ggYa V'm***** %\$È+
:][i fY'*\$!* 'Cj Yb': Ub'5ggYa V'm***** %\$È,
:][i fY'*\$!+'=bWta]b[; Ug:]hYf'5ggYa V'm***** %\$È-
:][i fY'*\$!, 'FYXW]cb '<YUhYf'5ggYa V'm***** %\$È%\$
:][i fY'*\$!-'57'Dck Yf'8]ghf]Vi h]cb'5ggYa V'm***** %\$È%
:][i fY'*\$!%\$'G')XY'6`cW'_5XUdhYf'5ggYa V'm***** %\$È%&
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:][i fY'*\$!%(' <YUhYf'6fUW_Yh'5ggYa V'm***** %\$È%)
:][i fY'*\$!% 'A]Wc'7UfcI gY'5ggYa V'm***** %\$È%*
:][i fY'*\$!%* '7ca Vi gh]cb 'Hi VY'7Ud***** %\$È%+
:][i fY'*\$!%+'8i U': i fbUVW'k#7Ud'A]Wc'5ggYa V'm***** %\$È%
:][i fY'*\$!% '8i U': i fbUVW'5ggYa V'm%'cZ(***** %\$È%-
:][i fY'*\$!%-'8i U': i fbUVW'5ggYa V'm&'cZ(***** %\$È&\$

:][i fY '%\$! & \$ ' 8 i U ' : i fbUW ' 5ggYa V'm' 'cZ (' '\$E &%
:][i fY '%\$! & % ' 8 i U ' : i fbUW ' 5ggYa V'm(' '\$E &&
:][i fY '%\$! & : i fbUW ' A Ub]Zc`X ' 5ggYa V'm' ' '\$E &
:][i fY '%\$! & ' F Y X i W\cb < YUhYf DUbY ' '\$E &(%\$E &
:][i fY '%\$! & (' 7 Y `` Cj Yb ' 5ggYa V'mG\YYh' % '\$E &) %\$E &
:][i fY '%\$! &) ' 7 Y `` Cj Yb ' 5ggYa V'mG\YYh' & '\$E & *
:][i fY '%\$! & * ' @cUX]b[< YUX ' 5ggYa V'm' '\$E & +
:][i fY '%\$! & + ' 9 i d`cXYX' J]Yk ' % '\$E &, %\$E &
:][i fY '%\$! &, ' 9 i d`cXYX' J]Yk ' & '\$E &-
:][i fY '%\$! &- ' 9 i d`cXYX' J]Yk ' '\$E ' \$ %\$E &
:][i fY '%\$! ' \$ ' 9 i d`cXYX' J]Yk ' ('\$E ' % %\$E &
:][i fY '%\$! ' % ' 9 i d`cXYX' J]Yk ') '\$E ' & %\$E ' &
:][i fY '%\$! ' & '@ZhG]XY' J]Yk '\$E ' & %\$E ' &
:][i fY '%\$! ' ' F][\h'G]XY' J]Yk '\$E ' (%\$E &
:][i fY '%%d % ' 8]ghf]Vi h\cb ' UbX'Dck Yf' 9bhfm '\$E &
:][i fY '%%d & ' DbYi a Uh]W\ `ck ' 7Ufx '\$E & (%\$E &
:][i fY '%%d ' < YUhYf ' 7cbhfc '\$E & (%\$E)
:

Disposal of WEEE and the Wheeled Bin Symbol

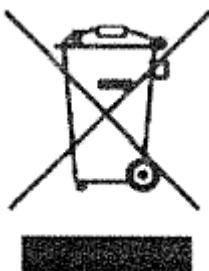
=b'&\$\$&ž' h\ Y' 9i fcdYUb' l b]cb' jb\fcXi W\X' h\ Y' 8]fYV\j Y' cb' K UghY' 9' YV\j]W' UbX' 9' YV\j]W' 9ei]da Ybh'fK 999L' H\ Y'a U]b'U]a' cZ h\ Y' 8]fYV\j Y' jg'hc' Ybgi fY' h\ Uh'K 999' jg'W' YV\j]W' UbX' hfYUhYX' gYdUfUhY'm'K 999' a Um'Wt'bH]b' \ UnUfXci g'gi VghUbWg' h\ Uh' g\ci' X'bch'YbX'i d'jb' h\ Y' f\i a Ub\Ybj]fcba Ybh'VYV\j gY' jh'Wb' \ Uj' Y' UXj YfgY' YZZYWg' cb' jh''

: i f\h\Yfa cfY\z'K 999' jg'U'j Ugh'gci fW'cZfUk' a UhYf]U'g' K]h\ h\ Y' Yj Yf'f]g]b['k cf'Xk]XY' XYa UbX' Zcf'bYk' Yei]da Ybh'UbX' h\ Y' Yj Yf'XYW\j]Ug]b['j c'i a Y'cZfUk' a UhYf]U'g']b' bUh' fY' Yh\j]b['h\ jg'dch'YbH]U'gci fW'cZgi W' a UhYf]U'g' [c'hc' k' UghY' jg' i b'UW\j]d\hUV'Y'

=Z'Yei]da Ybh'jg'W' YV\j]W' gYdUfUhY'm' h\ Y' Yei]da Ybh'Wb' VY' fYV\j]W' UbX' i d'hc' ,) i hc' - \$i' cZ h\ Y' Yei]da Ybh'Wb' VY' fYi gYX' U'g' bYk' a UhYf]U'g' Uj]b['h\ Y' i gY'cZj']f[]b' fUk' a UhYf]U'g' UbX' YbYf[mcZdfcXi W]b['h\ YgY' GYdUfUhY' W' YV\j]cb' UbX' hfYUha Ybh'cZK 999' k' h\ i g'XYW\j]Ug'Y' 7C' & Ya]gg]cbg'Ug'k Y'''

: cf' h\ Y' UVcj Y' fYUgcbg'@97C' Yl dYV\j]YbX' i gYfg'hc' X]gdcgY'cZ h\ Y'a UhYf]U']b' Ub' Ybj]fcba Ybh'U'm'Z]YbX'mik Um'VY]b['gYdUfUhY' W' YV\j]cb' UbX' hfYUha Ybh'''

9' YV\j]W' UbX' 9' YV\j]W' 9ei]da Ybh'jg'UVY'YX'k']h\ h\ Y' Zc'ck']b['W'cggYX' ci h' k' YY'YX' V]b' gma Vc'ž]bX]W\j]b['h\ Uh' h\ Y' Yei]da Ybh'g\ci' X'VY'X]gdcgYX'cZVm'h\ Y' YbX' i gYf'gYdUfUhY' Zca' ch\ Yf' hmdYg'cZk UghY'''

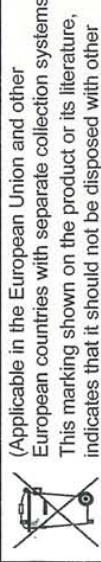


9bX' i gYfg'g\ci' X'Wt'bH]UW' h\ Y]f'XYU'Yf#X]ghf]Vi hc'cf'ci f' W'a dUbmUVci h'X]gdcgU'z'W' YV\j]cb' fYV\j]W]b['cdh]cbg' UbX' GUZYhm'8Uh'G\YYhg'fG8G']bZcfa Uh]cb\]b' h\ Y]f' W'ti bhfm'

English

Correct Disposal of This Product (Waste Electrical & Electronic Equipment)

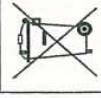
(Applicable in the European Union and other European countries with separate collection systems) This marking shown on the product or its literature, indicates that it should not be disposed with other household wastes at the end of its working life. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate this from other types of wastes and recycle it responsibly to promote the sustainable reuse of material resources. Household users should contact either the retailer where they purchased this product, or their local government office, for details of where and how they can take this item for environmentally safe recycling. Business users should contact their supplier and check the terms and conditions of the purchase contract. This product should not be mixed with other commercial wastes for disposal.



Français

Comment éliminer ce produit (déchets d'équipements électriques et électroniques)

(Applicable dans les pays de l'Union Européenne et aux autres pays européens disposant de systèmes de collecte sélective) Ce symbole sur le produit ou sa documentation indique qu'il ne doit pas être éliminé en fin de vie avec les autres déchets ménagers. L'élimination incontrôlée des déchets pouvant porter préjudice à l'environnement ou à la santé humaine, veuillez le séparer des autres types de déchets et le recycler de façon responsable. Vous favoriserez ainsi la réutilisation durable des ressources matérielles.

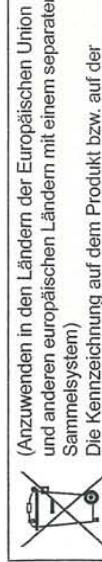


Les particuliers sont invités à contacter le distributeur leur ayant vendu le produit ou à se renseigner auprès de leur mairie pour savoir où et comment ils peuvent se débarrasser de ce produit afin qu'il soit recyclé en respectant l'environnement. Les entreprises sont invitées à contacter leurs fournisseurs et à consulter les conditions de leur contrat de vente. Ce produit ne doit pas être éliminé avec les autres déchets commerciaux.

Deutsch

Korrekte Entsorgung dieses Produkts (Elektromüll)

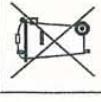
(Anzuwenden in den Ländern der Europäischen Union und anderen europäischen Ländern mit einem separaten Sammelsystem) Die Kennzeichnung auf dem Produkt bzw. auf der dazugehörigen Literatur gibt an, dass es sich bei seinem Lebensdauer nicht zusammen mit dem normalen Haushaltsmüll entsorgen werden darf. Entsorgen Sie dieses Gerät bitte getrennt von anderen Abfällen, um der Umwelt bzw. der menschlichen Gesundheit nicht durch unkontrollierte Müllbeseitigung zu schaden. Recyceln Sie das Gerät, um die nachhaltige Wiederverwertung von stofflichen Ressourcen zu fördern. Private Nutzer sollten den Händler, bei dem das Produkt gekauft wurde, oder die zuständigen Behörden kontaktieren, um in Erfahrung zu bringen, wie sie das Gerät auf umweltfreundliche Weise recyceln können. Gewerbliche Nutzer sollen sich an Ihren Lieferanten wenden und die Bedingungen des Verkaufsvertrags konsultieren. Dieses Produkt darf nicht zusammen mit anderem Gewerbemüll entsorgt werden.



Español

Eliminación correcta de este producto (material eléctrico y electrónico de descarte)

(Aplicable en la Unión Europea y en países europeos con sistemas de recogida selectiva de residuos) La presencia de esta marca en el producto o en el material i informático que lo acompaña, indica que al finalizar su vida útil no deberá eliminarse junto con otros residuos domésticos. Para evitar los posibles daños al medio ambiente o a la salud humana que representa la eliminación incontrolada de residuos, separe este producto de otros tipos de residuos y reciclelo correctamente para promover la reutilización sostenible de recursos materiales.

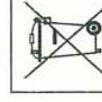


Los usuarios particulares pueden contactar con el establecimiento donde adquirieron el producto, o con las autoridades locales pertinentes, para informarse sobre cómo y dónde pueden llevarlo para que sea sometido a un reciclaje ecológico y seguro. Los usuarios comerciales pueden contactar con su proveedor y consultar las condiciones del contrato de compra. Este producto no debe eliminarse mezclado con otros residuos comerciales.

Netherlands

Correcte verwijdering van dit product (elektrische & elektronische afvalapparatuur)

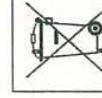
Dit merkteken op het product of het bijbehorende informatiebladje duidt erop dat het niet met ander huishoudelijk afval verwijderd moet worden aan het einde van zijn gebruiksduur. Om mogelijke schade aan het milieu of de menselijke gezondheid door ongecontroleerde afvalverwijdering te voorkomen, moet u dit product van andere soorten afval scheiden en op een verantwoorde manier recyclen, zodat het duurzame hergebruik van materiaalbronnen wordt bevorderd. Huishoudelijke gebruikers moeten contact opnemen met de winkel waar ze dit product hebben gekocht of met de gemeente waar ze wonen om te vernemen waar en hoe ze dit product milieuvriendelijk kunnen laten recyclen. Zakelijke gebruikers moeten contact opnemen met hun leverancier en de algemene voorwaarden van de koopovereenkomsten nalezen. Dit product moet niet worden gemengd met ander bedrijfsafval voor verwijdering.



Italiano

Corretto smaltimento del prodotto (rifiuti elettrici ed elettronici)

(Applicabile in i paesi dell'Unione Europea e in quelli con sistemi di raccolta differenziata) Il marchio riportato sul prodotto o sulla sua documentazione indica che il prodotto non deve essere smaltito con altri rifiuti domestici al termine del ciclo di vita. Per evitare eventuali danni all'ambiente o alla salute causati dall'inopportuno smaltimento dei rifiuti, si invita l'utente a separare questo prodotto da altri tipi di rifiuti e di riciclarlo in maniera responsabile per favorire il riutilizzo sostenibile delle risorse materiali. Gli utenti domestici sono invitati a contattare il rivenditore presso il quale è stato acquistato il prodotto o l'ufficio locale preposto per tutte le informazioni relative alla raccolta differenziata e al riciclaggio per questo tipo di prodotto. Gli utenti aziendali sono invitati a contattare il proprio fornitore e verificare i termini e le condizioni del contratto di acquisto. Questo prodotto non deve essere smaltito unitamente ad altri rifiuti commerciali.



Czech Republic

Správná likvidace tohoto produktu

(Znění elektrického a elektronického zarizení)



Tato značka zobrazená na produktu nebo v dokumentaci znamená, že by neměl být používán s jinými domácími zařízeními po skončení svého funkčního období. Aby se zabránilo možnému zněčictění životního prostředí nebo zranění člověka díky nekontrolovanému zničení, odkážte je prosím od dalších typů odpadu a recyklujte je zodpovědně k podpoře opětovného využití hmotných zdrojů.

Členové domácnosti by měli kontaktovat jak prodejce, u něhož produkt zakoupili, tak místní vládní kancelář, ohledně podrobnosti, kde a jak můžete tento výrobek bezpečně vzhledem k životnímu prostředí recyklovat.

Obchodníci by měli kontaktovat své dodavatele a zkонтrolovat všechny podmínky koupě. Tento výrobek by se neměl mítchat s jinými komerčními produkty, určenými k likvidaci.

Estonia

Õige viis toote kasutusest kõrvaldamiseks

(elektriliste ja elektrooniliste seadmete jäätimed)

Selline tähisustootel või selle dokumentidel näatab, et toodet ei tohi kasutusaja lõppemisel kõrvaldada koos muude olmejäätmetega. Seeleks, et vältida jäätmete kontrollimatu kõrvaldamiseni, sootud võimaliku kahju tekitamist keskkonnale või inimesele terveisele ning edendada materialeisele vahendite säastavat taaskasutust, eraldage toode muudest jäätmetest ja suunake taasringlusse.

Kodukasutajad saavad teavet keskkonnaohutu ringlussevõrtu kohta kas toote müüjalt või keskkonnaasematist.

Firmad peabid võtma ühendust tamjaga ning kontrollima ostulepingu tingimusi ja sätteid. Toodet ei tohi panna muude hävitamiseks mõeldud kaubandusjäätmete hulka.

Finland

Tämän tuotteeen turvallinen hävittäminen

(elektroniikka ja sähkölaitteet)

Ohneinen merkintä tuotteessa tai tuotteen oheismateriaalissa merkitsee, että tästä tuotetta ei tulé hävittää kotitalousjätteen mukana sen elinkaaren päätyttyä. Hallitusmatoista jätteenkäsitelystä ympäristöölle ja kansainvälisen terveydelle aiheutuvien vaarinkohien välttämiseksi tuote tullee käsitellä muista jätteistä erillään. Jäte on hyvä kierrättää raaka-aineiksi keskävän ympäristökehityksen takia. Kotitalouskäytätilien tulisi ottaa yhteyttä tuotteen myyneeseen jälleenmyyjään tai paikalliseen ympäristöviranomaiseen, joita antavat lisätietoja tuotteen turvalistista. Kierrätysmahdollisuksista. Yrityskäytätilien tulisi ottaa yhteyttä tavarantoiittajaan ja selvitää hankintatasomuksen ehdot. Tästä tuotetta ei tulé hävittää muun kaupallisen jätteen seassa.

Slovenia

Ustrezeno odstranjevanje tega izdelka

(odpadna električna in elektronska oprema)



Oznaka na izdelku ali spremjevalni dokumentaciji pomeni, da ga na koncu uporabne dobe ne smemo odstranjevati skupaj z drugimi gospodinjskimi odpadki. Da bi preprečili morebitno tveganje za okolje ali zdravje človeka zaradi nenadzorovanega odstranjevanja odpadkov, izdelek ločite od drugih vrst odpadkov in ga odgovorno uporabljajte ter tako spodbudite trajnostno ponovno uporabo materialnih virov.

Uporabniki v gospodinjstvih naj za podrobnosti o tem, kam in kako lahko odnesajo ta izdelek na okoliš varno reciklanje, poklicajo trgovino, kjer so izdelek kupili, ali lokalni vladni urad. Podjetja naj poklicajo dobavitelja in preventijo pogojev nabavne pogodbe. Tega izdelka pri odstranjevanju ne smete mesati z drugimi gospodarskimi odpadki.

Sweden

Korrekt avfallshantering av produkten

(elektriska och elektroniska produkter)

Denna markering på produkten och i manuallen anger att den inte bör sorteras tillsammans med annat hushållsavfall när dess livstid är över. Till förebyggande av skada på miljö och hälsa bör produkten hanteras separat för åndamålsenlig återvinning av dess beständsdelar.

Hushållsanvändare bör kontakta den återförsäljare som säljt produkten eller sin kommun för vidare information om var och hur produkten kan återvinnas på ett miljösjälvert sätt.

Företagsanvändare bör kontakta leverantören samt verifiera angivna villkor i köpekontraktet. Produkten bör inte hanteras tillsammans med annat kommersiellt avfall.

Latvia

Izstrādājuma pareiza likvidēšana

(nolieotās elektriskās un elektroniskās ierīces)

Uz izstrādājuma vai tam pievienotajās instrukcijās dotais markējums norāda, ka to nedrīkst likvidēt kopā ar citiem sadzīves atkritumiem pēc tā ekspluatācijas laika. Lai novērstu videi un cilvēku veselībai iespējamo kaitējumu, kas ir saistīts ar nekontrolējamu atkritumu likvidēšanu, tas jānoskji no citiem atkritumiem un jāpārrādā, lai sekmētu materiālo resursu atbilstoju atkārtotu lietošanu.

Mājsaimniecības lietotājiem jāsazinās vai nu ar veikaluu, kurā šis izstrādājums ir pirkts, var ar pāsvaidību, lai iegūtu informāciju par to, kā un kur var nodot šo izstrādājumu, lai garantētu ekoloģiski drošu reciklēšanu.

Rūpniecībākajiem lietotājiem jāsazinās ar piegādātāju un jāpārbauða pirkuma līguma nosacījumi. So izstrādājumu neviens nejāstās sajaukt ar citiem likvidējamiem rūpniecīskajiem atkritumiem.

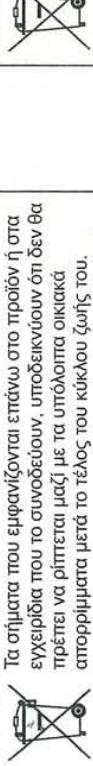
Greece

Σωστή Διάθεση αυτού του Προϊόντος

(Απορρίματα Ηλεκτρικού & Ηλεκτρονικού Εξοπλισμού)

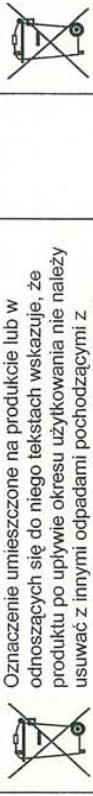
Τα σήματα που εμφανίζονται επάνω από την πρόσθια ή στα εγγερτίδια που το σημαίνουν, υποδεικνύουν ότι δεν θα πρέπει να ρίχτεται μαζί με τα υπόλοιπα οικακά σπέρματα μετά το τέλος του κύκλου λήψης του. Προκειμένου να αποφευχθείν την εύθετον εβδομάδες βλαβερές συνέπειες από τη χρήση της προϊόντος, προτείνουμε να εξασπιάσετε την χρήση της προϊόντος από την παρακαλούμε να το διαχωρίσετε από άλλους τύπους απορριμμάτων και να το ανακυκλώσετε, ώστε να βοηθήσετε στην βιώσιμη επαναχρησιμοποίηση των οικακών πόρων.

Οι οικακοί χρήστες θα πρέπει να έχουν σε επικοινωνία είτε με τον πιλοτή από την αγόραστη αυτό το πρόϊόν, είτε της κατά πότους υπηρεσίες, προκειμένου να πληροφορηθούν της λεπτομέρειες σχετικά με τον τόπο και τον τρόπο με τον οποίο μπορούν να διαλογήσουν αυτό το πρόϊόν για ασφαλή πλήρη απορρίψη. Οι επιχειρήσεις χρήστες θα πρέπει να έχουν σε επειρού με τον προμηθευτή ποις και να ελεγχουν τους ορός και τις προϋποθέσεις του αγιοβολού πώλησης. Το προϊόν αυτό δεν θα πρέπει να αναχρίσεται με δίλλα αυγήθερμα απορριμμάτα προς διάθεση.



Prawidłowe usuwanie produktu

(zużytý sprzęt elektryczny i elektroniczny)



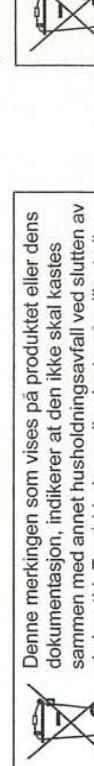
Oznaczenie umieszczone na produkcie lub w odnieszyciach się do niego tekstach wskazuje, że usuwać z innymi odpadami pochodzącyimi z gospodarstw domowych. Aby uniknąć szkodliwego wpływu na środowisko naturalne i zdrowie ludzi wskutek niekontrolowanego usuwania odpadów, prosimy o oddzielenie produktu od innego typu odpadów oraz, odpowiedzialny recykling w celu promowania ponownego użycia zasobów materiałnych jako starej praktyki.

W celu uzyskania informacji na temat miejsca i sposobu bezpiecznego dla środowiska recyklingu tego produktu użytkownicy w gospodarstwach domowych powinni skontaktować się z punktem sprzedazy detalicznej, w którym dokonali zakupu produktu, lub z organem władz lokalnych. Użytkownicy w firmach powinni skontaktować się ze swoim dostawcą i sprawdzić warunki umowy zakupu. Produktu nie należy usuwać razem z innymi odpadami komercyjnymi.

Norway

Korrekt avhenging av dette produkt

(Avfall elektrisk og elektronisk utstyr)



Denne merkingen som vises på produktet eller dens dokumentasjon, indikerer at den ikke skal kastes sammen med annet husholdningsavfall ved sluttet av sin levetid. For å hindre mulig skade på miljøet eller menneskelig helse fra ukontrollert avfallsavhending, venligst atskill dette fra andre typer avfall og resirkuler det ansvarlig for å fremme bærekraftig gjennbruk av materielle ressurser.

Husholdningsbrukere bør kontakte enten forhandleren de kjøpte produktet av, eller lokale myndigheter, for detaljer om hvor og hvordan de kan frakte denne artikkelen for miljømessig trygg resirkulering.

Forretningsbrukere bør kontakte sin leverandør og undersøke vilkårene i kjøpekontrakten. Dette produktet skal ikke blandes med annet kommersielt avfall som skal kastes.

Poland

Prawidłowe usuwanie produktu

(zużytý sprzęt elektryczny i elektroniczny)



Ta etykieta που εμφανίζεται επάνω από την πρόσθια ή στα εγγερτίδια που το σημαίνουν, υποδεικνύουν ότι δεν θα πρέπει να ρίχτεται μαζί με τα οικακά σπέρματα μετά το τέλος του κύκλου λήψης του. Προκειμένου να αποφευχθείν την εύθετον εβδομάδες βλαβερές συνέπειες από τη χρήση της προϊόντος, προτείνουμε να εξασπιάσετε την χρήση της προϊόντος από άλλους τύπους απορριμμάτων και να το ανακυκλώσετε, ώστε να βοηθήσετε στην βιώσιμη επαναχρησιμοποίηση των οικακών πόρων.

Οι οικακοί χρήστες θα πρέπει να έχουν σε επικοινωνία είτε με τον πιλοτή από την αγόραστη αυτό το πρόϊόν, είτε της κατά πότους υπηρεσίες, προκειμένου να πληροφορηθούν της λεπτομέρειες σχετικά με τον τόπο και τον τρόπο με τον οποίο μπορούν να διαλογήσουν αυτό το πρόϊόν για ασφαλή πλήρη απορρίψη. Οι επιχειρήσεις χρήστες θα πρέπει να έχουν σε επειρού με τον προμηθευτή ποις και να ελεγχουν τους ορός και τις προϋποθέσεις του αγιοβολού πώλησης. Το προϊόν αυτό δεν θα πρέπει να αναχρίσεται με δίλλα αυγήθερμα απορριμμάτα προς διάθεση.



Macedonia

Правилно отстранување на овој производ

(Истроиена електрична и електронска опрема)



Ова ознака прикажана на производот или во неговата документација покажува дека тој не треба да се фрила со преостанатото отпад од домакинствата, кога веќе нема да биде потребен. За да се избегне можноот нарушување на животната средина или на човековото здравје, како резултат на неконтролираното отстранување на отпадот, во минимум да го одделите од другите видови отпад и совесно да го рециклирате, за да промовирате поддржива повторна употреба на материјалните ресурси.

Корисниците во домакинствата треба да се обратат до дистрибуторите или до купувачите производот или до локалните власти, за да ги дознават деталиите за тоа каде и како можат да го однесат производот заради рециклирање коешто е безбедно животната средина.

Деловите корисници треба да се обратат до нивните набавувачи и да ги проверат условите од договорот за купопродајба. При отстранувањето, овој производ не треба да се меша со другиот комерцијален отпад.

Bulgaria

Изхвърлянето правилно този продукт

(отпадъчно електрическо и електронно оборудване)



Това обозначение на продукта или съпътстващите го материали означава, че той не бива да бъде изхвърлен заедно с другите битови отпадъци след края на полезния му живот. За да се предотврати възможното увреждане на околната среда или човешки живот от безконтролното изхвърляне на отпадъци, може отиделят такива продукти от другите видове отпадъци и го рециклирайте, демонстрирайки отговорно отношение към настъпването на устойчива многократна употреба на материјални ресурси.

При употреба за битови нужди тръбва да се свърже с продавача на дреди, от когото се закупили продукта или с местните власти за поддръжка относно това къде и как можете да предадете продукта за безопасно рециклиране.

При употреба за стопански нужди тръбва да се свърже с доставчика си и да проверите реда и условията в договора за закупуване. Този продукт не тръбва да се смесва с други отпадъци на работното място.

Romania & Moldova

Evacuarea corectă a acestui produs

(reziduuri provenind din aparatūră electrică și electronică)



Marcajele de pe acest produs sau menționate în instrucțiunile sale de folosire indică faptul că produsul nu trebuie aruncat împreună cu alte reziduuri din gospodărie atunci când nu mai este în stare de funcționare. Pentru a preveni posibile efecte dăunătoare asupra mediului înconjurător sau a sănătății oamenilor datorate evacuării necontroleate a reziduuri sau, vă rugăm să separați aceste reziduuri de reziduuri și să-i reciclați în mod responsabil pentru a promova refolosirea resurselor materiale.

Utilizatorii casnici sunt rugați să ia legătura fie cu distributorele de la care au achiziționat acest produs, fie cu autoritățile locale, pentru a primi informații cu privire la locul și modul în care pot depozita acest produs în vederea reciclării sale ecologice.

Companiile sunt rugate să ia legătura cu furnizorul și să verifice condițiile stipulate în contractul de vânzare. Acest produs nu trebuie amestecat cu alte reziduuri de natură comercială.

Norway

Korrekt avhenging av dette produkt

(Avfall elektrisk og elektronisk utstyr)



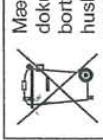
Denne merkingen som vises på produktet eller dens dokumentasjon, indikerer at den ikke skal kastes sammen med annet husholdningsavfall ved sluttet av sin levetid. For å hindre mulig skade på miljøet eller menneskelig helse fra ukontrollert avfallsavhending, venligst atskill dette fra andre typer avfall og resirkuler det ansvarlig for å fremme bærekraftig gjennbruk av materielle ressurser.

Husholdningsbrukere bør kontakte enten forhandleren de kjøpte produktet av, eller lokale myndigheter, for detaljer om hvor og hvordan de kan frakte denne artikkelen for miljømessig trygg resirkulering.

Forretningsbrukere bør kontakte sin leverandør og undersøke vilkårene i kjøpekontrakten. Dette produktet skal ikke blandes med annet kommersielt avfall som skal kastes.

Denmark

Korrekt affaldsbortskaffelse af dette produkt (elektrisk & elektronisk udstyr)



Mærket på dette produkt eller i den medfølgende dokumentation betyder, at produktet ikke må bortskaffes sammen med almindelig husholdningsaffald efter endt levetid. For at undgå skadelige miljø- eller sundhedspavirkninger på grund af ukontrolleret affaldsbortskaffelse skal dette produkt bortskaffes separat fra andet affald og indleveres behørigt til fremme for bearbejdigt materialegenvinding.

Hjemmebrugere bedes kontakte forhandleren, hvor de har købt produktet, eller den lokale myndighed for oplysning om, hvor og hvordan de kan indlevere produktet med henblik på miljøtværfri genvinding.

Entreprenører bedes kontakte leverandøren og læse betingelserne og vilkårene i købkontrakten. Dette produkt bør ikke bortskaffes sammen med andet entervesaffald.

Slovakia

Správna likvidácia tohto výrobku (Elektrotechnický a elektronický odpad)



Toto označenie na výrobku alebo v sprievodnej brožúre hovorí, že po skončení jeho životnosti by nemal byť likvidovaný s ostatným odpadom. Prípadnému poškodeniu životného prostredia alebo ľudského zdravia môže predstaviť tým, že budeť takéto typy výrobkov oddelovať od ostatného odpadu a vrátiť ich na recykláciu.

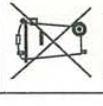
Používateľia v domácnostíach by pre podrobnejšie informácie, ako ekologickej bezpečnosti naložiť s týmto výrobkom, mali kontaktovať bud' predajcu, ktorý im výrobok predal, alebo príslušný úrad v okolí ich bydliska.

Priemyselní používateľia by mali kontaktovať svojho dodávateľa a preventívne si podmienky kúpnej zmluvy. Tento výrobok by nemal byť likvidovaný spolu s ostatným priemyselným odpadom.

Hungary

A termék megfelelő leadása

(Elektromos és elektronikus készülékek hulladékkezelése)



A terméken vagy a hozzá tartozó dokumentáción szereplő jelzés arra utal, hogy hasznos élettartama végén a terméket nem szabad háztartási hulladékkel együtt kidobjani. Annak érdekében, hogy megeörzézhető legyen a szabálytalan hulladékleadás által okozott környezeti és egészségügyi károsodás, különítse ezt el a többi hulladékktól, és felelősségteljesen gondoskodjon a hulladék leadásáról, a hulladékhasználásra célfájából.

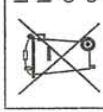
A háztartási felhasználók a termék forgalmazójával vagy a helyi önkormányzati szervizektől kerjenek tanácsot arra vonatkozóan, hogy és hogyan vethetik el ez elhasznált terméket a környezetvédelmi szempontból biztonságos hulladékleadás céljából.

Az üzleti felhasználók léptekben kapcsolatba a forgalmazóval, és vizsgálják meg az adásvételi szerveződés feltételeit. A terméket nem szabad leadni kereskedelmi forgalomból származó egyéb hulladékkel együtt.

Republic of Ireland (Gaelic)

Diúscairt Cheart an Táirge Seo

(Teangeolaíocht Leictreach agus Leictreonach Dramhaila)



Léiriom an mharcáil seo atá ar an táirge nó sa litriom a thaghann leis, nár chóir é a dhiúscairt le dramhail tí eile ag deireadh a shaoil oibre. Chun cosaint i gcoine dochar don chomhshaoil nó do shláinte an duine, a dhfeadhadh bheith mar thoradh ar an ndiúscairt dramhaila neamhtheoiranta, scar an dramhail seo ó chineálacha eile dramhaila le do thoil agus déan athchuráil fhineagrach air chun athúsaíd innmarthana na hacmhainní i lábharrtha a chur chun cinn.

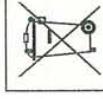
Ba chóir doibh siud a úsáideann an trealamh sa bhailte duí i dieagmháil leis an dioltóir ónar cheannaithe siad an táirge seo, nō lena n-oifig áitiúil Rialtais, ar mhaithe le sonrai a thail faoi cá háit agus cathain is féidir athchúrsáil atá slán ó thaobh an chomhshaoil de a dhéanamh ar an táirge seo.

Ba chóir doibh siud a úsáideann an trealamh seo ina ngató dul i dieagmháil leis an soláthóir agus téarmáil agus coimhollacha an chonartha ceannaithe a sheiceáil. Nior chóir an táirge seo a chur le dramhail eile tráchtala agus diúscairt á déanamh.

Portugal

Eliminação Correcta Deste Produto

(Resíduo de Equipamentos Eléctricos e Electrónicos)



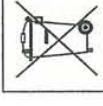
Esta marca, apresentada no produto ou na sua literatura indica que ele não deverá ser eliminado juntamente com os resíduos domésticos indiferenciados no final do seu período de vida útil. Para impedir danos ao ambiente e à saúde humana causados pela eliminação incontrolada de resíduos deverá separar este equipamento de outros tipos de resíduos e reciclar-lo de forma responsável, para promover uma reutilização sustentável dos recursos materiais.

Os utilizadores domésticos deverão contactar ou o estabelecimento onde adquiriram este produto ou as entidades oficiais locais para obterem informações sobre onde e de que forma podem levar este produto para permitir efectuar uma reciclagem segura em termos ambientais. Os utilizadores profissionais deverão contactar o seu fornecedor e consultar os termos e condições do contrato de compra. Este produto não deverá ser misturado com outros resíduos comerciais para eliminação.

Lithuania

Tinkamas produktu atlieku tvarkymas

(atitamavusi elektros ir elektronikos įranga)



Šis ženklas, pateikiamas ant produkto ar jo dokumentacijoje, nurodo, kad pastabaigus produktu tarnavimo laikui, jo negalima išmiseti kartu su kitomis buitinėmis atliekomis. Kad būtu išvengta galimos nekontroliuojamo atlieku išmetimo žalos aplinka, arba žmonių sveikatai, ir siekiant skatinoti aplinka tausojantį antrinį, žaliavų panaudojimą, pašon antrinį atlieku perdibti.

Informacijos, kur ir kaip pristatyti ši produkta saugiai perdibti, privatus vartotojai turėtų kreiptis arba į pardotuvę, kurioje ši produkta pirkto, - arba Lietuvos valdžios institucijas. Verslo vartotojai turėtų kreiptis į savo tiekėją iš peržiūrėti pirkimo sutarties sąlygas. Šis produktas tvarkant atliekas negali buti sumaisytas su kitomis atliekomis.

Software License

6m]bgHJ]b['h Y '@WbgYX GcZhk UfYz h Y '@WbgYY UW_bck 'YX[Yg'h h Y '@WbgYY 'Ug' fYUX 'Jh' i bXYfghUbXg 'Jh' UbX'U[fYYg 'h Y 'Vci bX'Vm]hg'h Yfa g'UbX'Zl f h Yf'U[fYY'h Y 'h Jg' h Y 'Vta d'YhY'UbX'YI'Wl g'j Y'g h Yfa Ybh'cZ'h Y'GcZhk UfY '@WbgY VYh Y'Yb'h Y 'dUfh]Yg'k \]Wl gi dYfgYXYg 'UbX'a Yf[Yg'U' df'fcdfcg'g'z'i bXYfghUbX]b[g'UbX'ch'h Yf'U[fYYa Ybh'g'cfU'UbX'k f]h Yb'z'VYh Y'Yb'h Y 'dUfh]Yg'fY'Uh]b['h c'h Y'gi V'Vh'ia UhYf'cZ'h Jg' GcZhk UfY '@WbgY 'UbX'h Y 'h Yfa g'cZ'di fWl UgY'cfXYfg'gi Va]h YX'Vm '@WbgYYz'h Y 'h Yfa g'cZ'h Jg' GcZhk UfY '@WbgY 'g'U'Wbhf'c''

H]g'g'Ub'U[fYYa Ybh'VYh Y'Yb'h Y '@WbgYY'UbX'@97C'7cfdfUh]cb'f'@97C'f'cZ' \$\$\$ '@U_Yj]Yk'5j Ybi Yz'Gh'>cgYd\z A]Wl][Ub'(- \$,)!& - *'ck bYf'cZ'h Y '@WbgYX GcZhk UfY '@WbgY 'g'dYVl]Yg'h Y 'WbX]h]cbg'i bXYf'k \]Wl '@WbgYY'a Um i gY'h Y '@WbgYX GcZhk UfY ''

I. Definitions

"@WbgYX GcZhk UfY " g'U' a YUb'h Y'g'cZhk UfY'gi dd'YX'k]h' h Jg' GcZhk UfY '@WbgYz k \]Wl 'g'cZhk UfY'XYj Y'cdYX'UbX'X]ghf]Vi h YX'Vm@97C'"

"=bghfi Wl]cb'A Ubi U' g'U' a YUb'U'[i]XY'XYgWl]V]b['h Y'i gY'UbX'cdYfUh]cb'cZ'h Y '@WbgYX GcZhk UfYz'h c[Yh Yf'k]h' UbmfY'UhYX'gi ddcfh]b['XcWa Ybh]cb"

"@WbgYY " g'U' a YUb'UbX']bWl XY'UbmcZ'h Y '@WbgYYf]Xj]g]cbg'UbX'XYdUfha Ybh'g'k]h']b['@WbgYYf]cf[Ub'nUh]cbz'Vi h g'U' bch']bWl XY'k \ c'mcf'dUfh]U'mick bYX'gi Vg]X]Uf]Yg'UZZ]UhYg'gi WYggcfg cf'Ugg][bg'cf']bXYdYbXYbh'h]fX'dUfh]Yg"

II. License Grant

@97C '\YfYVm[fUbhg'h '@WbgYYz'UbX '@WbgYY '\YfYVm'UWYdhg'gi V'Vh'hc'h Y 'h Yfa g'UbX'WbX]h]cbg'g'Yh'Zcfh']b' h Jg' GcZhk UfY '@WbgYz'U'bcb! YI'Wl g'j Y'z'bcb! h'UbhgZfUV'Y']WbgY'hc'i gY'h Y '@WbgYX GcZhk UfY'UbX'=bghfi Wl]cb'A Ubi U'Ug'g'Yh'Zcfh']b' h Jg' GcZhk UfY '@WbgY ''H Y 'h Yfa '']WbgY'Ug'i g'YX']b' h Jg' GcZhk UfY '@WbgY'g'U' a YUb'UbX']bWl XY' .

UE' h Y'f][\h'hc'i gY'U'WdmicZ'h Y '@WbgYX GcZhk UfY]b' YI'YWhUV'Y'Zcfa 'VmcbY'i gYf'Uh'U'hja Y'/

VE' h Y'f][\h'hc'i gY'UbX'Wdmih'Y'=bghfi Wl]cb'A Ubi U'Zcf'@WbgYYf]b'hYfbU' cdYfUh]cbg'/UbX'

WE' h Y'f][\h'hc'a U_Y'cbY'VUW_i d'WdmicZ'h Y '@WbgYX GcZhk UfY ''

=b'UWYdh]b['h Y'']WbgY'[fUbhYX'Vm@97C'z '@WbgYY'U[fYYg'h'Uh]h'g'U' bch' h'UbhgZfUV'Y']bWl X]b['Ubmk'c'mcf'dUfh]U'mick bYX'gi Vg]X]Uf]Yg'UZZ]UhYg'gi WYggcfg cf'Ugg][bg'k]h'ci h'h Y'YI' dfYgg'WbgbYbh'cZ@97C' /

&'' i gY'h Y '@WbgYX GcZhk UfY'cb'a cfY'h'Ub'cbY'fP'&'7DI'U'Ub'mcbY'hja Y' /

'''' Wl gY'cf'dYfa]hi bUi h'cf]nYX'Wdm]b[z'fYdfcXi Wl]cbz'cf'X]gWcgi fY'cZ'Ubm dcfh]cb'cZ'h Y '@WbgYX GcZhk UfY'cf'=bghfi Wl]cb'A Ubi U'cf'h Y'X]ghf]Vi h]cb'cZ'Ubm dUfh'h YfYc'Z'hc'Ubmh']fX'dYfgcb'cf'Ybh]hm'Zcf'Ubmdi fdcgY'k \ UhgcYj Yf''''H Jg' fYghf]Wl]cb'g'U'Wbhf]b'Y'h'c'V]bX '@WbgYY'UbX']hg'U[Ybhg'VYmcBx'h Y 'h Yfa]bUh]cb'cZ'h Jg' GcZhk UfY '@WbgY'cf' /

('') UhhYa dh'hc'X]gUggYa V'Y'a cX]Zm'cf'fYj YfgY'Yb[]bYYf'h Y '@WbgYX GcZhk UfY' /

) '' UhhYa dh'hc'XYZUh'cf'XYZUh'h Y'Wdm'dfch'Wl]cb'a YWl'Ub]ga /

* '' UhhYa dh'hc'cf'UWYgg'ZUh'fYg'bch'di fWl UgYX''

III. Enhancements And Support

@97C 'a Umla U_Y_Uj U]UVY'hc '@WbgYY i dXUhYg'UbX'Yb\UbWa Ybhg'hc h\Y '@WbgYX' GcZhk UfYz k \]W '@WbgYY'a UmUWVdhUh'h\Y'hja Y'jhg'cZyfYX'hc '@WbgYY'Vm\Umjb[UbmUdd]WVY'Y i dXUhY'ZYY'@97C 'g\U''\Uj Y'h\Y'gc'Y'X'gWYh]cb'hc XYhYfa]bY'h\Y' i dXUhY'ZYY'@g'cZU''gi W i dXUhYg'UbX'Yb\UbWa Ybhg'Vm '@WbgYY'g\U''VY'gi VYVW' hc'h\Y'h\Yfa g'UbX'WbX]h]cb'cZh]g'GcZhk UfY '@WbgY'i b'Ygg'gi dd'Ya YbhYX'cf' fYd'UVWX'VmU'gi VgYei Ybh']WbgY''

IV. Termination Of Software License

=b'h\Y'Yj Ybh'cZU'a UhYf]U'XYZUj 'hVm '@WbgYY'cf']hg'U[Ybhg'cZ'Ubmidfcj]g]cb'cZh]g' GcZhk UfY '@WbgYz@97C 'a UmhYfa]bUhY'hc'g'GcZhk UfY '@WbgY'i dcb'h\]fhmfl \$L'XUm' k f]hYb'bch]W''@ dcb'h\Yfa]bUh]cb'cZh]Y'GcZhk UfY '@WbgYz'h\Y '@WbgYY'g\U''fYh'fb' U'Wd]Yg'cZh]Y '@WbgYX'GcZhk UfY'hc '@97C ''H\]g'cV'][Uh]cb'g\U''gi f]j Y'h\Y' h\Yfa]bUh]cb'cZh]g'GcZhk UfY '@WbgY''

V. Copyright And Proprietary Information

@WbgYY'UW_bck'YX[Yg'h\Uh'h\Y '@WbgYX'GcZhk UfY'UbX'h\Y =bghfi W]cb'A Ubi U' Wbgh]h\h\j U'i UVY'UbX'Wdmf][\hYX'dfcdfYhmcZ@97C 'UbX'h\Uh'U''h\hY'UbX'ck bYfg\]d' f][\hg']b'h\Y '@WbgYX'GcZhk UfY'UbX'fY'UhYX'a UhYf]U'g'fYa U]b'Yi W g]j Y'mk]h\ '@97C ''@97C 'fYgYfj Yg'U''f][\hg'k]h\ fYgdYWh]hc'h\Y '@WbgYX'GcZhk UfY'UbX'=bghfi W]cb' A Ubi U'i bXYf'U''Udd]WVY'Uk g'Zcf'h\Y'dfchYWh]cb'cZ'dfcdf]YhUfm]bZcfa Uh]cb'z']bW X]b['Vi h'bch']a]hYX'hc'z'hUXY'gYWYhg'Wdmf][\hg'z'hUXY'a Uf_gz'UbX'dUhYbhg''

VI. Limitation Of Liability And Warranties

K]h\ fYgdYWh]hc'h\Y'd\mg]W'a YX]U'cb'k \]W'h\Y '@WbgYX'GcZhk UfY'g'XY'j j YfYX'UbX' =bghfi W]cb'A Ubi U'@97C 'k UffUbhY'hc'Y'gla Y'hc'VY'ZfYY'cZ'XYZYWh'g]b'a UhYf]U'g'UbX' k cf_a Ubg\]d'Zcf'U'dYf]cX'cZb]bYhmf'l \$L'XUm'Zfca' h\Y'XUhY'cZ'XY'j Yfm' '=b'h\Y'Yj Ybh' cZ'bch]ZWh]cb'k]h\]b'h\Y'k UffUbhmidYf]cX'cZ'XYZYWh'g]b'a UhYf]U'cf'k cf_a Ubg\]d'@97C 'k]'fYd'UVW'h\Y'XYZWh]j Y'a YX]U'cf'XcWa YbUh]cb''@97C 'gdYWh]W'mX]gWU)a g' U'ch\Yf'k UffUbhYg'z'YfVW'UbhUV']hm'UbX'Z]bYgg'Zcf'U'dUfhW'Uf'di fdcgY'k]h\ fYgdYWh]hc' XYZWh'g]b'h\Y'a YX]U'UbX'XcWa YbUh]cb''=b'bc'Yj Ybhg'U''@97C 'VY'Zcf'Ubm' 'cgg'cZ'dfcZ]h'XUhj'cf'i gYz'cf'Ubmch'Yf'Wa a YfWU'Xua U[Yz]bW X]b['Vi h'bch' ']a]hYX'hc'gdYWh]U'z'bW]XYbUh'z'Wbgyei Ybh]U'z'bhYffl dh]cbg'j b'@WbgYY'cdYfUh]cbg'cf' ch\Yf'Xua U[Yg'fY'UfX'Ygg'cZbY['][YbW'cf'ZU' 'h'@97C fg'']UV']hm'jb'WbbYWh]cb'k]h\ h\]g'GcZhk UfY '@WbgY'g\U''bch'Yi WYX'h\Y'j U'i Y'cZh]Y'Ua ci bhg'dU]X'Vm '@WbgYY' i bXYf'h\]g'GcZhk UfY '@WbgY'Zcf'h\Y '@WbgYX'GcZhk UfY'k \]W'[Uj Y'f]gY'hc'h\Y'cgg' Ygg'U'fYUgcbUV'Y'Ua ci bh'Zcf'i gYz'Xua U[Y'UbX'cVgc'YgWbW''

VII. Confidentiality

5 ``]bZcfa Uh]cb UbX'a UhYf]U'g'fY[UfX]b['h Y'gcZhk UfY'z'dfcj]XYX'h'@WbgYY'Vm@97C' k \]VU'UfY'bch[YbYfU'm_bck b]b['h Y'hfUXY'UfY'WbZ]XYbh]U'z'UfY'dfcdf]YhUfm'UbX' gi VV']bZcfa Uh]cb UbX'a UhYf]U'g'UfY'Z'fb]g\YX'gc'Y'mZcf'h Y'i gY'cZ'@WbgYY'i bXYf'h'lg' GcZhk UfY'@WbgY''@WbgYY'U[fYYg'bch'h'i gY'cf'X]gWcgY'Ubmgi VV']bZcfa Uh]cb cf' a UhYf]U'ch'Yfk]gY'k]h ci h'df]cf'k f]hYb'WbgbYbh]Zca '@97C'UbX'@WbgYY'Z'f'Yf' U[fYYg'h'c'JU_Y'U'f'YUgcbUV'Y'ghYdg'f'Yei YghYX'Vm@97C'z'cf'ch'Yfk]gY'bYVWggUfm'h' dfchYVh'Y'WbZ]XYbh]U'lmcdZU'gi VV']bZcfa Uh]cb UbX'a UhYf]U'g' 'h'Y'ZcfY[c]b['cV'][Uh]cbg'k]'gi f]jj Y'hyfa]bUh]cb'cZ'h]g'GcZhk UfY'@WbgY'Z'UbX'@WbgYY'U[fYYg'h'c' f'Yh'fb'U'gi VV']bZcfa Uh]cb UbX'a UhYf]U'g'hc'@97C'i dcb'f'Yei Ygh'cf'Ubm'bcb!fYbYk U' cf'hyfa]bUh]cb'cZ'h]g'GcZhk UfY'@WbgY''

VIII. Miscellaneous

U' 'H'g'GcZhk UfY'@WbgY'g'U'VY'V]bX]b['i dcb'UbX']bi fY'hc' 'h'Y'VYbYZjh'cZh'Y'dUfh]Yg' 'YfYh'UbX'h'Y'f'YgdYVWj'Y'gi VV'ggcfg'UbX'Ugg][bgz'dfcj]XYX'h'Uh'@WbgYY'g'U' bch'\Uj'Y'Ubmif]['h'hc'Ugg][b]hg'f]['hg'cf'cV'][Uh]cbg'i bXYf'h']g'GcZhk UfY'@WbgY' fk'Yh'Yf'VmcdYfUh]cb'cZ'Uk'cf'ch'Yfk]h ci h'Y'df]cf'k f]hYb'WbgbYbh'cZ'@97C''

V' '5``bch]Wg'YfYi bXYf'g'U'VY']b'k f]h]b['UbX'g'U'VY'g'Ybh'VmifY']g'h'f'YX'cf' Wf]Z'YX'a U]dcghU[Y'dfYdU]X'hc'@97C'Uh'h'Y'UXxFYggYg'Z]fgh'k f]hYb'UVcj'Y'''H'Y' XUh'Y'cZdcgha Uf'_g'U'VY'XXYa YX'h'Y'XUh'Y'cb'k]VU'gi VV' bch]W'g'[jj Yb''

W' 'Bc'XY'Umcb'h'Y'dUfh'cZ@97C']b'YI YfVWj]b['Ubmif]['h'dck Yf'cf'f'Ya YXm'YfYi bXYf' g'U'cdYfUh'Y'Ug'U'k Uj'Yf'Yf'YcZ'bcf'g'U'Ubmig]b['Y'cf'dUfh]U'YI YfVWjg'Y'cZ'Ubm' gi VV'f]['h'dck Yf'cf'f'Ya YXmidfYVW XY'Ubmich'Yf'cf'Z'f'Yf'YfVWjg'Y'YfYcZ'cf'h'Y' YI YfVWjg'Y'cZ'Ubmich'Yf'f]['h'dck Yf'cf'f'Ya YXm'

X' 'Bc'Ua YbXa Ybh'za cX]Z]VWj]cb'cf'k Uj'Yf'cZ'cf'Ubm'WbgbYbh'k]h'fYgdYVWjhc'z'Ubm' dfcj]g]cb'cZ'h]g'GcZhk UfY'@WbgY'g'U'VY'YZZVWj'Y'i b'Ygg'h'Y'g'Ua Y'g'U'VY']b' k f]h]b['UbX'g'][bYX'UbX'XY']j'YfYX'VmYUW'cZ'h'Y'dUfh]Yg'YfYh'cZ'UbX'h'Yb'gi VV' Ua YbXa Ybh'za cX]Z]VWj]cb'k Uj'Yf'cf'WbgbYbh'g'U'VY'YZZVWj'Y'cb'm]b'h'Y'gdYVWjZ'W']bghUbVW'UbX'Zcf'h'Y'di fdcgY'Zcf'k]VU'[jj Yb''

Y' 'H'g'GcZhk UfY'@WbgY'g'U'VY'Wbghfi YX']b'UWtfXUbW'k]h'UbX'[cj'YfbYX'Vm'h'Y']b'hYfbU'Uk'g'cZ'h'Y'GhJh'cZA]VU']b'''K'YfYj'Yf'dcgg]V'Y'Z'YUW'dfcj]g]cb'cZ'h]g' GcZhk UfY'@WbgY'g'U'VY']b'hYfdfYhYX']b'gi VV'a UbbYf'Ug'hc'VY'YZZVWj'Y'UbX'j'U]X' i bXYf'Udd']VU'Y'Uk'z'Vi'h']Z'Ubm'dfcj]g]cb'cZ'h]g'GcZhk UfY'@WbgY'g'U'VY' dfc]\V]hYX'Vmcf']bj'U']X'i bXYf'gi VV'Uk'z'gi VV'dfcj]g]cb'g'U'VY']b'YZZVWj'Y'hc'h'Y' YI h'Yb'h'cZ'gi VV'dfc]\V]h]cb'cf']bj'U']X]hm'k]h ci h']bj'U']XUh]b['h'Y'f'Ya U]bXYf'cZ'gi VV' dfcj]g]cb'cf'h'Y'f'Ya U]b]b['dfc]g]cb'cZ'h]g'GcZhk UfY'@WbgY''

Z' '@WbgYY'U[fYYg'h'Uh']h'g'fYgdcbg]V'Y'Zcf'cVhU]b]b['dfcdYf'Ui'h'cf'nUh]cb'UbX' W'a d'm]b['k]h'Ubm'Yl dcfh'fY'Yl dcfh'cf']a dcfh'Uk'g'cf'fY'[i'Uh]cbg'UbX'h'Uh'a Um' Udd'm]Z@WbgYY'Yl dcfh'g'fY'Yl dcfh'g'cf']a dcfh'k'Y'@WbgYX'GcZhk UfY'z' h'YVWbc'c[mcf'h'YVWb]VW'XUh]VW'WbgYX'YfYi bXYf''

Warranty

9ei]da Ybh'a Ubi ZUWf fYX'Vm@97C '7cfdfUh]cbzGh">'>cgYd\z'A]W][Ub 'g'k UffUbhYX'ZfYY'Zca XYZYVW]b'a UhYf]U'UbX'k cf_a Ubg\]d'Zcf'U'dYf]cX'cZ%&h]fHYYb'a cbh\g'Zfc 'XUhY'cZ g\]da Ybh'cf'&Eh Yj Y'a cbh\g'Zfc 'XUhY'cZ]bghU'Uh]cbz'k \]W Yj Yf'cWV fg'Zfgh' 9ei]da Ybh' bch'a Ubi ZUWf fYX'Vm@97C 'g'Wtj YfYX'hc'h Y'YI hYbh'cZk UffUbhmidfcj]XYX'Vmh'Y'cf][]bU' a Ubi ZUWf fYf'UbX'h]g'k UffUbh'mXcYg'bch'Wtj Yf'Ub'm'Yei]da Ybh'z'bYk'cf'i gYXz'di fWVUgYX' Zfc 'Ubmc'bY'ch'Yf'h'Ub'@97C '7cfdfUh]cb"5'fYd'UWV a Ybh'dUfhg'g\U'VY'Wtj YfYX'i bXYF' k UffUbh'mZf'U'dYf]cX'cZh]fhlmXUmg'Zfc 'XUhY'cZdi fWVUgY' **LECO makes no other representation or warranty of any other kind, expressed or implied, with respect to the goods sold hereunder, whether as to merchantability, fitness for purpose, or otherwise.**

9I dYbXUV'Y']hYa g'gi W'Ug'W'V'W'Yg'z'W'a Vi gh]cb'h VYg'z'W'Ya]W'g'z'UbX']hYa g'cZ' _Y'bUh fY' UfY' bch'Wtj YfYX'Vm'h]g'k UffUbh'm'

@97C f'g'c'Y'cV'][Uh]cb'i bXYf'h]g'k UffUbh'mg\U'VY'hc'fYdU]f'cf'fYd'UW'UbmidUfh'cf'dUfhg' k \]W'z'hc'ci f'gUh]gZUWf]cbz'dfcj Y'hc'VY'XYZYVW]j Y'i dcb'fYh' fb'dfYdU]X'hc'@97C '7cfdfUh]cbz' Gh">'>cgYd\z'A]W][Ub'']H'g'cV'][Uh]cb'XcYg'bch]bW XY'UVcf'hc']bghU'fYd'UWV a Ybh'dUfhg'z'bcf' XcYg']h'Wtj Yf'Ub'mZU]i fY'Xi Y'hc'UVW]XYbh'z'UVi gYz'bY['YWz'cf'i gY']b'X]gfY[UfX'cZ]bghfi W]cbg' z'fb]g'YX'Vm@97C"=b bc'Yj Ybhg'\U'XUa U[Yg'Zf'XYZYVW]j Y'[ccXg'YI WYX'h'Y'di fWVUgY' df]W'cZh'Y'[ccXg'z'UbX' **LECO shall not be liable for incidental or consequential damages whatsoever.**

5'WU]a g'j]b'fY[UfX'hc'h'Y'dUfhg'cf'Yei]da Ybh'a i gh'VY'a UXy'k]h'j]b'h'Yb'fP\$E'XUmg'UZhYf' Di fWVUgYf'YUfbg'cZh'Y'ZUWf'g'i dcb'k \]W'h'Y'WU]a']g'VUgYX'"5i h'cf]nUh]cb'a i gh'VY'cVhU]bYX' Zfc ' @97C 'df'cf'hc'fYh'fb]b['Ubmc'h'Yf'dUfhg'']H'g'k UffUbh'm]g'j c]XYX'VmZU]i fY'hc'W'a d'm' k]h' h'Yg' bch'W'fYei]fyA Ybhg"

Notice

The warranty on LECO equipment remains valid only when genuine LECO replacement parts are employed. G]bW'@97C ' \Ug'bc'Wbhf'c'cj Yf'h'Y'e'U]hmc'f'di f]hmc'Z Wbgi a UVY'dfcXi Wg'bch'a Ubi ZUWf fYX'Vm@97C'z'h'Y'gdYVW]W]h]cbg'Zcf'UWVfUWf'cZfYg' 'hg' i g]b['@97C ']bghfi a Ybhg'UfY'bch' [i UfUbh'YY' i b'Ygg' [Ybi]bY'@97C 'Wbgi a UVYg'UfY' Ya d'cmYX']b'Wb' i bW]cb'k]h' @97C ']bghfi a Ybhg'"=Zdi fWVUgYf'XYZU'hg']b'a U_]b['dUma Ybh' Zcf'UbmidUfhg'cf'Yei]da Ybh'z'h]g'k UffUbh'mg\U'VY'j c]X'UbX'g\U' bch'Udd'mh'gi W' dUfhg'UbX' Yei]da Ybh' 'Bc'UhY'dUma Ybh'cf'W fY'cZ'XYZU' 'h]b' dUma Ybhg'\U'YI hYbX'h'Y'k UffUbh'mdYf]cX' dfcj]XYX' \YfY]b"

@97C '7cfdfUh]cb']g'bch'fYgdcbg]V'Y'Zcf'XUa U[Y'hc'Ub'm'UggcW]UhYX']bghfi a Ybhg'z'Yei]da Ybh'z' cf'UddUfUh'g'bcf'k]''@97C 'VY' \Y'X'']UV'Y'Zcf'cgg'cZ'dfcZ]h'cf'ch'Yf'gdYVW]U'XUa U[Yg'fYg' 'h]b[' Zfc 'UVi gYz'bY['YWz'cf'i gY']b'X]gfY[UfX'cZ]bghfi W]cbg'']H'Y'6i mYfz'h'Y]f'Ya d'cmYg'z'U[Ybhg'z' UbX'gi W]Vggcfg']b']b'YfYgh'Uggi a Y'U'f]g_g'UbX'']UV']h'Yg'Zcf'hc'Y'cdYfUh]cbz'i gYz'UbX#cf' a]gi gY'cZh'Y'dfcXi Wf]b'XYgW]VYX' \YfY]b' UbX'U[fYY'hc']b'XYa b]Zm' \c'X' \Ufa 'Ygg'z'UbX' XYZYbX'h'Y'gY'Yf'Zfc 'Ub'm'UbX'U'WU]a g'UbX'UWf]cbg'Uf]g]b['Zfc 'Ub'm'W]i gY'k \UhgcYj Yfz']b'WV X]b['gY'Yffg'bY['][YbW'Zcf'dYfgcbU']b'f'm]b'WVffYX']b'W'bb'W]cb'k]h' h'Y'i gY'cZ'gU]X' dfcXi Wf]b'E'UbX'Ub'm'UbX'U'XUa U[Yg'dfcl]a UhY'm'fYg' 'h]b['h'YfYZfc' "

LECO-Supplied Computers

Hewlett-Packard® Support

5``@97C!gi dd`]YX`<Yk`YH DUW_UfX`Wta di hYfg`]bW XY`<D`W ghca Yf`
hYVWb]W`gi ddcfh`UbX`k UffUbhmWU]a`]bZcfa Uh]cb``
H`Y`]bW g]cb`cZ<D`W ghca Yf`hYVWb]W`gi ddcfh`UbX`dfcXi W`k UffUbhm
k Jh`@97C!gi dd`]YX`<D`7ca di hYfg`Ybgi fYg`h`Uh`UbmiWta di hYf! fY`UhYX`
gYfj]W`]ggi Yg`UfY`\UbX`YX`X]fYVWmVm`h`Y`YI dYfhg`Uh`<D`H`]g`
Y`]a`]bUhYg`h`Y`bbYVWggUfmighYd`cZk cf_]b[`h`fc`[`h`Y`@97C`gYfj]W`
dfcZYgg]cbU`g`Zcf`U`fYgc`i h]cb`Z`ca`<D`
: cf`a`cfY`]bZcfa Uh]cb`W``%`,*!*`!%`+`)>`cf`UWVgg`h`Y`<D`k`YVg]h`Y`
VmZc`ck`]b[`h`Y`]b_`VY`ck`UbX`gYYVW`]b[`h`Y`Uddfcdf]Uh`Y`W`i b`hfm`UbX`
gi ddcfh`Ub[`i U[Y`

\Hd.##k k , "\d"Wta #!g#Yb#WtbHUW\ d##k k !WtbHUW! i g"\ha`

H`Y`YI dYX]h`Y`gYfj]W`d`YUgY`\Uj`Y`mc`f`<D`Wta di hYf`gYf]U`bi`a`VYf`UbX`
a`cXY`bi`a`VYf`Uj`U]`UV`Y`k`Yb`W`bHUW`]b[`<D`H`YgY`W`b`VY`Zci`bX`cb`
h`Y`VUW`cf`g]XY`cZ`h`Y`Wta di hYf`hck`Yf`

Declaration of Conformity Statement

European Union Directives - CE Marking

H\g[Yei]da Ybh\k \]V\YUfg\h\Y'79 A Uf_]b[\Wta d\Yg\k]h\U\h\Y'Udd\]W\Y' fYei]fYa Ybh\gYh\ci h]b\h\Y'9I '8]fY\W\j Yg"

NOTE → H\Y'9I '8Y\WUfUh]cb\cZ'7ca d\Ub\W\f9I !8c7\Zcf\h\g\]bghfi a Ybh\g\Uj U\UV\Y'i dcb\ fYei Ygh"

H\Y'Zc\ck]b[\]bZcfa Uh]cb\gYhg\ci h\h\Y'W\h\Y'W\h\Y'Zc\ck\h\Y'9I !8c7\z\]b\W X]b[\U\]gh\cZ'9I '8]fY\W\j Yg\z\Ufa cb]nYX\gh\UbX\UfXg\gi dd\cf\h]b[\gh\UbX\UfXg\UbX\ch\Yf\Udd\]W\Y' Xc\W a Ybh\g"

Machinery Directive 2006/42/EC (Product Safety)

9B '=GC '%&%\$ \$ F]g_ '5ggYgga Ybh! GUZYhmcZ\A UW\]bYfm'

9B#=97 '*%\$%\$!%'GUZYhmfYei]fYa Ybh\Zcf\Y\Y\W\]W\Yei]da Ybh\Zcf\ a YUgi fYa Ybh\Zcf\z\UbX\UVcfUhcfmii gY"

EMC Directive 2004/108/EC (Electromagnetic Compatibility)

9B) \$%%F: '9a]gg]cbg\7\Ugg\5''

9B '*%\$%\$!' !& '9B '*%\$%\$!' !%& <Ufa cb]W9a]gg]cbg''

9B '*%\$%\$!' !' / '9B '*%\$%\$!' !%& :]W\Yf'9a]gg]cbg''

9B '*%&*!%9A 7\fYei]fYa Ybh\Zcf\Y\Y\W\]W\Yei]da Ybh\Zcf\ a YUgi fYa Ybh\Zcf\z\UbX\UVcfUhcfmii gY"

7=GDF%%F: '9a]gg]cbg\7\Ugg\5''

=97 '*%\$%\$!(!& 9\Y\W\fcg\h\U\]W8]g\W\Uf[Y''

=97 '*%\$%\$!(!' F UX]Uh\YX\ F: 'a a i b]\h\m'

=97 '*%\$%\$!(! (: Ugh\Hf\Ubg]Ybh\6i fgh'

=97 '*%\$%\$!(!) 'Gi f[Y=a a i b]\h\m'

=97 '*%\$%\$!(! * 7cbXi \W\YX\ F: 'a a i b]\h\m'

=97 '*%\$%\$!(!, 'A U[bYh\W=a a i b]\h\m'

=97 '*%\$%\$!(!%& J c\h\U[Y\8]dg\z\=bh\Yff\ dhg'

Product Safety

H\ Y\ Yei]da Ybh\]g\ Ugc\ XYg][bYX\ UbX\ a\ Ubi ZUV\ fYX\ hc\ a\ YYh\h\ Y\ Zc\`ck]b[\dfcXi W\ gUZYhmfYei]fYa Ybhg"\`

International

=97\ * %\$%\$! % GUZYhmfYei]fYa Ybhg\ Zcf\ Y\ YWf]W\ `Yei]da Ybh\ Zcf\ a\ YUgi fYa Ybh\ Wtbhfc\`z\ UbX\`UVcfUhcfmi gY"\`

USA

I @\ * %\$%\$! % GUZYhmfYei]fYa Ybhg\ Zcf\ Y\ YWf]W\ `Yei]da Ybh\ Zcf\ a\ YUgi fYa Ybh\ Wtbhfc\`z\ UbX\`UVcfUhcfmi gY"\`

Canada

75B#7G5! 7&&"& 'Bc"* %\$%\$! GUZYhmfYei]fYa Ybhg\ Zcf\ Y\ YWf]W\ `Yei]da Ybh\ Zcf\ a\ YUgi fYa Ybh\ Wtbhfc\`z\ UbX\`UVcfUhcfmi gY"\`

Australia & New Zealand

5G#BNG\ * %\$%\$! % GUZYhmfYei]fYa Ybhg\ Zcf\ Y\ YWf]W\ `Yei]da Ybh\ Zcf\ a\ YUgi fYa Ybh\ Wtbhfc\`z\ UbX\`UVcfUhcfmi gY"\`

Electromagnetic Compatibility Notices

USA

Federal Communications Commission (FCC) statement

H\g\Yei]da Ybh\Ug\Ygg\YX\UbX\Zci bX\hc\Wta d\mk]h\h\Y\]a]hg\Zcf\U\7\Ugg\5\ X][\hU\XYj]W\z di fgi Ubh\hc\DUfh%\cZ\h\Y: 77\fi \Yg"\h\YgY\]a]hg\UfY\XYg][b\YX\hc\ dfcj]XY\fYUgcbUVY\dfch\W\cb\U[U\bgh\Ufa Z\]bh\YfZYfYb\W\k\Yb\h\Y\Yei]da Ybh\]g\ cdYfUh\YX\]b\U\Wta a Yf\W\U\Ybj]fcba Ybh\H\Yg\Yei]da Ybh\YbYfUh\Yg\i\gYg\UbX\W\Ub\ fUX\]U\YfUX\]c\Z\Yei Yb\W\YbYf[m\UbX\Z\bc\]bg\U\YX\UbX\i\gYX\]b\UW\UfX\Ub\W\k\]h\h\Y\]bh\h\W\cb\Ubi U\z\Ufa Um\W\i\gY\Ufa Z\]bh\YfZYfYb\W\hc\]fUX\]c\Wta a i b\W\h\cb\ C\YfUh\cb\cZ\h\]g\Yei]da Ybh\]b\U\fYg\]XYbh\U\UfYU\]g\]_Y\m\h\W\i\gY\Ufa Z\]bh\YfZYfYb\W\z\]b\k\]W\W\gY\h\Y\i\gYf\k\]VY\fYei]fYX\hc\W\ff\Y\h\Y\]bh\YfZYfYb\W\Uh\]g\ ck b\Yl\dybgY"

DfcdYf\mig\]Y\XYX\UbX\fc\i bXYX\W\Yg\UbX\W\bb\Y\W\cfg\i g\YX\]b\cfXYf\hc\i YYh\ : 77\Ya]gg\cb\]a]hg"\@97C\7cfdfU\h\cb\]g\bc\h\Ygdc\bg\]V\Y\Zcf\Ubm\UfUX\]c\cf\h\Y\Yj\]gl\cb\]bh\YfZYfYb\W\W\i\gYX\W\mi\g\]b\c\h\Yf\h\Ub\]fY\Wta a YbXYX\W\Yg\UbX\W\bb\Y\W\cfg\cf\Vm\ i\bi\h\cf\]nYX\W\Ub[Yg\cf\i cX\]Z\W\h\cb\g\h\Y\]g\Yei]da Ybh\i\bi\h\cf\]nYX\W\Ub[Yg\cf\ a cX\]Z\W\h\cb\W\i\X\j\c]X\h\Y\i\gYf\]Ui\h\cf\]hm\h\cdYfUh\h\Y\Y\]da Ybh\h\Y\X\Yj\]W\W\ta d\]Yg\k\]h\DUfh%\cZ\h\Y: 77\fi \Yg"\C\YfUh\cb\]g\gi\V\Y\W\h\hc\h\Y\ Z\c\ck\]b\h\c\W\h\cb\]cb\]f\p\&\h\]g\XYj\]W\i\Um\bc\h\W\i\gY\Ufa Z\]bh\YfZYfYb\W\z\UbX\]f\&\h\]g\XYj\]W\i\gh\U\W\dh\U\bm\]bh\YfZYfYb\W\]fY\W\j\YX\z\]b\W\X\]b\]bh\YfZYfYb\W\h\U\h\]a\] [\h\W\i\gY\i\bXYg\]fYX\cdYfUh\cb"

Canada

Industry Canada Class A Emission Compliance Statement

7Yh\UddUfY\]bi a ff]ei Y\XY\U\W\Ugg\Y\5\Ygh\W\h\Z\fa\Y\{ \U\bc\fa\Y\BA\6!\\$\\$' \Xi\7Ub\UXU\'' H\g\7\Ugg\5\X\]hU\UddUfU\h\g\Wta d\]Yg\k\]h\7Ub\UX\]Ub\=79G!\\$\\$' ''

European Union

European Union EMC Directive conformance statement

H\g\dfcXi\W\]g\]b\W\h\Z\fa\]h\mk\]h\h\Y\dfch\W\cb\fYei\]fYa\Ybh\g\cZ\9\i\7ci\b\W\8\]fY\W\j\Y\ &\\$\$(\#%, #97\cb\h\Y\Uddfcl\]a\U\h\cb\cZ\h\Y\Uk\g\cZ\h\Y\A\Ya\VVf\Gh\h\Y\g\fY\U\h\]b[\h\c\ Y\Y\W\fa\U[b\Y\h\W\ta\U\h\]V\]h\m\@97C\7cfdfU\h\cb\W\bb\ch\U\W\dh\Ygdc\bg\]V\]h\m\Zcf\Ubm\ Z\j\i\Y\h\c\g\h\g\Z\h\Y\dfch\W\cb\fYei\]fYa\Ybh\g\fYgi\h\]b[\Z\fa\U\bc\fa\Ui\h\cf\]nYX\ a cX\]Z\W\h\cb\cZ\h\Y\dfcXi\W\i\

Attention: H\g\]g\Ub\9B\)) \\$%%7\Ugg\5\'; fc\i d\%dfcXi\W\i\=b\U\Xca\Ygh\W\ Ybj\]fcba\Ybh\h\]g\dfcXi\W\ta\Um\W\i\gY\]fUX\]c\]bh\YfZYfYb\W\z\]b\k\]W\W\gY\h\Y\i\gYf\i\Um\ VY\fYei\]fYX\hc\h\Y\UX\Yei\U\h\Y\i\YUgi\fYg\''

Australia & New Zealand

Attention: H\g\]g\U\7=GDF\%7\Ugg\5\dfcXi\W\i\=b\U\Xca\Ygh\W\bj\]fcba\Ybh\h\]g\ dfcXi\W\ta\Um\W\i\gY\]fUX\]c\]bh\YfZYfYb\W\z\]b\k\]W\W\gY\h\Y\i\gYf\i\Um\Y\]fYX\hc\h\Y\UX\Yei\U\h\Y\i\YUgi\fYg\''

Radio-Frequency Disturbance

This product complies with IEC/EN 55011/CISPR11 Radio-frequency disturbance characteristics of industrial, scientific and medical equipment (ISM), k \]W fYg H Y Z c ck]b []bZcfa Uh]cb hc 'VY dfcj]XYX k]h]b h Y l gYf' 8cWa YbUh]cb.

NOTE → H Y i gY cZ **Interconnecting Cables** chYf h Ub h cgY dfcj]XYX UbX#cf gdYV]YX a UmWji gY i bXYg]fYX Y YWfca U[bYh]WWta dUh]V]hmidYfZcfa UbW

Definitions

NOTE → H]g]g U 7 Ugg 5 ; fci d % DfcXi W

Class A Yei]da Ybh]g Yei]da Ybh'gi]hUVY Zcf i gY]b U YghUV]g\ a Ybhg chYf h Ub Xca Ygh]WUbX h cgY X]fYVWmWbbYVWYX hc U ck !j c hU[Y'dck Yf gi dd'mbYh cf_ h Uh gi dd]Yg Vi]X]b [g i gYX Zcf Xca Ygh]Wdi fdcgYg"

Class B Yei]da Ybh]g Yei]da Ybh'gi]hUVY Zcf i gY]b Xca Ygh]WYgHUV]g\ a Ybhg UbX]b YghUV]g\ a Ybhg X]fYVWmWbbYVWYX hc U ck !j c hU[Y'dck Yf gi dd'mbYh cf_ h Uh gi dd]Yg Vi]X]b [g i gYX Zcf Xca Ygh]Wdi fdcgYg"

Group 1 Yei]da Ybh WbhU]bg U Yei]da Ybh]b h Y gWtdY cZ h]g gHUbXUfX h Uh]g bch WUgg]YX Ug [fci d & Yei]da Ybh"

Group 2 Yei]da Ybh WbhU]bg U =GA F: Yei]da Ybh fHbXi ghf]U z GWYbh]Z W A YX]W L]b k \]W fUX]c! ZfYei YbWh Ybf [m]b h Y ZfYei YbWh fUb [Y - _ < n hc (\$\$) < n]g]bhYbh]cbU m[YbYfUhYX UbX i gYXZ cf cb mi gYXZ]b h Y Zcfa cZY YWfca U[bYh]W fUX]Uh]cb z]bXi Whj Y UbX#cf WdUW h]j Y Wi d]b [z Zcf h Y hfYUha Ybh cZa UhYf]U cf]bgdYW]cb #UbU mg]g di fdcgYg"

Flicker and Harmonic Emissions

Hc fYXi W h Y W UbW cZj c`hU[Y Zi Wi Uhcbgž Z]W Yf Ya]gg]cbgž cf \ Ufa cb]W
Ya]gg]cbgž]h]g fYVta a YbXYX h Uh h]g Yei]da Ybh VY WbbYVYX hc U df]j UhY ck !
j c`hU[Y X]ghf]Vi h]cb gmghYa " =Z WbbYVYX hc U di V]Wck ! j c`hU[Y X]ghf]Vi h]cb gmghYa
U'a]b]a i a ZUVY]hmigYfj]W ffYbh WdUW hmicZ % \$ Ua dg]g fYei]fYX" 7cbgi hUh]cb
k]h h Y X]ghf]Vi h]cb gmghYa 'Ui h cf]hma UmVY fYei]fYX"

Equipment Packages

=hYa g`]ghYX'Ug'Zc`ck g'UfY'fYdYUhhX'hkfci [\ci h'h\]g'a Ubi U'UbX'UfY'gi V'YWhc' fYj]g]cb" D'YUgY'Wtbgj 'h'h\Y'dUW_]b['g`d'fYV]j YX'k]h\ h\Y']bg]fi a Ybh"

TRSMCHNC Package consisting of: *TruSpec Micro CHN* Carbon/Hydrogen/Nitrogen Determinator with External Computer

%& - !\$()	GC: HK 5F9? =H'HFI GD97
%\$%#+%<5Nh	5B<MBFCB9%\$!%* 'A 9G<%#@6
%\$&!%+(!<5Nh	@97CGCF6'&\$! '\$A 9G<') \$\$;
%*% !' , \$	75G9<C@89F'78!%&6@ 9#6@57?
%*&) !) %&%()	D57? '5779GGCFMHFI GD97'7<B'A=7FC'
%*! \$!&\$!%\$	5GGMHFI GD97 'A=7FC'7<B'&&J
%+\$(!&(%	5GGM?9M7CDMDFCH97H=CB
%*, *!)) \$	A CB=HCF'D7 '%- =B'B97
%*, *!*%*	5GGMD7'HCK 9F'HFI GD97'<D'

TRSMCHNCR Package consisting of: *TruSpec Micro CHN* Carbon/Hydrogen/Nitrogen Determinator without External Computer

%& - !\$()	GC: HK 5F9? =H'HFI GD97
%\$%#+%<5Nh	5B<MBFCB9%\$!%* 'A 9G<%#@6
%\$&!%+(!<5Nh	@97CGCF6'&\$! '\$A 9G<') \$\$;
%*% !' , \$	75G9<C@89F'78!%&6@ 9#6@57?
%*&) !) %&%()	D57? '5779GGCFMHFI GD97'7<B'A=7FC'
%*! \$!&\$!%\$	5GGMHFI GD97 'A=7FC'7<B'&&J
%+\$(!&(%	5GGM?9M7CDMDFCH97H=CB
%*! !%\$%(&%	8=G? '75@<5F8K 5F9'HFI GD97

' DUW_YX'UbX'g\]ddYX'gYdUfUhY'm]b'h\Y' "G"5"'Bch']bW XYX'k]h\]bhYfbUh]cbU'g\]da Ybhg'Xi Y'hc' g\]dd]b['fY[i 'Uh]cbg" 'h\YgY']hYa g'UfY'YggYbh]U'Zcf'cdYfUh]cb" '7cbhVWhmci f '@97C X]ghf]Vi hcf'Zcf' ei chUh]cb'UbX'XY']j Yfm'

**TRSMCHNSC Package consisting of: *TruSpec Micro CHNS*
Carbon/Hydrogen/Nitrogen/Sulfur Determinator with External Computer**

%&) - !\$()	GC: HK 5F9? =H'HFI GD97
%) \$% !%+ %! < 5Nf	5B< M8FCB9 %\$! %* 'A 9G< %#@6
%) \$& !%+ (!< 5Nf	@97CGCF6 &\$! '\$ A 9G< ') \$\$;
% * % !' , \$	75G9< C@89F 78!%& 6@ 9#6@57?
% * &) !) %& %(%*	D57? '5779GGCFMHFI GD97 '7< BG'A=7FC
% * \$! &\$\$! &\$\$	5GGMHFI GD97 'A=7FC '7< BG'&&J
% +\$(!&(%	5GGM? 9M7CDMDFC H97H=CB
% * , *!)) \$	A CB=HCF 'D7 '%=B'B97
% * , *!*%*	5GGMD7 'HCK 9F 'HFI GD97 '< D

**TRSMCHNSCR Package consisting of: *TruSpec Micro CHNS*
Carbon/Hydrogen/Nitrogen/Sulfur Determinator without External
Computer**

%&) - !\$()	GC: HK 5F9? =H'HFI GD97
%) \$% !%+ %! < 5Nf	5B< M8FCB9 %\$! %* 'A 9G< %#@6
%) \$& !%+ (!< 5Nf	@97CGCF6 &\$! '\$ A 9G< ') \$\$;
% * % !' , \$	75G9< C@89F 78!%& 6@ 9#6@57?
% * \$! &\$\$! &\$\$	5GGMHFI GD97 'A=7FC '7< BG'&&J
% +\$(!&(%	5GGM? 9M7CDMDFC H97H=CB
% * &) !) %& %(%*	D57? '5779GGCFMHFI GD97 '7< BG'A=7FC
% * , !%\$% (%&	8=G? '75@< 5F8K 5F9'HFI GD97

' f DUW_YX'UbX'g\]ddYX'gYdUfUhY'm]b 'h Y' l "G"5"'Bch']bW XYX'k]h 'jbhYfbUh]cbU'g\]da Ybhg'Xi Y'hc' g\]dd]b['fY[i 'Uh]cbg"'H\ YgY'jhYa g'UfY'YggYbh]U'Zcf'cdYfUh]cb"'7cbhUW'mci f '@97C 'X]ghf]Vi hcf'Zcf' ei chUh]cb'UbX'XY'j' Yfm'

Options

630-200-1OP TruSpec Micro Options

%*%-!` , \$` 5GGMJ 57I I A`<CH`<958`
%*%-!(`(` 5GGMJ 57I I A`<CH`<958`&&\$J`
%*%-!+\$(` 5GGM75FCI G9@A=7FC`GH57?` ``\$`
%+(`)%`*\$!%&\$` ?=H`65@5B79`A=7FC`*D@D7`7HF@`
%%`%\$%`!6#A` G7<9A 5H=7`756=B9H`HFI`GD97`A=7FC`
%*%-!`\$!*`\$!%&\$` ?=H`F9D@D@5H9`HCD`I`FB`8I`5@HFI`GD97`
%(`)\$&!`(*\$!<5N` D57?`HFI`9GG9BH`5@H-B`75D`%?`
%**`\$!\$&*` ?=H`HCC@G`<95H98`A`5B=C@8`H`
%(`)\$&!`(*%` GH8`FA`D<9B`M5@5B=B9`--`)`
%*&!)`%&(`(7FI`7=6@9`DCFCI`G`A=7FC`@CK`9F`#D?`
%**`\$!\$&-` ?=H`BGH5@5H-CB`E`I`5@=75H-CB`HF`GD`A=7FC`7<B`
%**`\$!\$`\$` ?=H`CD9F5H-CB`E`I`5@=75H-CB`HF`GD`A=7FC`7<B`
%(`)\$&!`(*` F95;`9BH`I`FB579`A=7FC`HFI`GD97`*`\$`
%**`\$!\$%`!%)`\$` D57?`HFI`GD97`898=75H98`A=7FC`588`CB`CLM`9B`
%=@G`\$`\$`(`(=@G`D57?`7CA`DCB9BH`HFI`GD97`
%=@G`\$`\$`(`(=@G`D57?`7CA`DCB9BH`HFI`GD97`A=7FC`
%*%*!)`*+!%&%` ;`5G?9H`F9D@579A`9BH`<?)`&`K`5M6I`B5`B`
%*%*!)`*+!%&` ;`5G?9H`F9D@579A`9BH`<?)`!`K`5M6I`B5`B`
%*%*!)`*+!%&%` ;`5G?9H`F9D@579A`9BH`<?)`G7F99B98`6I`B5`B`
%*%-!(`+*!%&%` ?=H`F9D@579A`9BH`9A`+HH9F`#F`
%*&!)`%&(`+` ?=H`I`D`F589`HFI`G`A=7FC`7<B`HC`7<BG`
%*&(`+` ?=D`I`F589`HFI`GD97`A=7FC`
%*&!)`(\$%`-\$` ?=H`I`FB579`I`D`F589`HFI`GD97`
%*&!)`(\$%`-\$` ?=H`I`5@`9`8=J`9FH9F`HFI`GD97`A=7FC`
%*&!)`(\$%`-\$` ?=H`F9;`I`@5HCF`DF9GGI`F9`&`GH5;`9`5=F`7;`5`(`*`
%*&!)`(\$%`-\$` ?=H`F9;`I`@5HCF`CLM`9B`7;`5`(`\$`
%(`)%`\$`-` GD97`G<99H`HFI`GD97`A=7FC`CLM`9B`588`CB`
%*`\$`!`(`(\$` ?=H`A=7FC`5B5@MG=G`@E`I`-8`
%*`\$`!`(`(\$` ?=H`BGH5@5H-CB`E`I`5@=75H-CB`HF`I`GD97`A=7FC`
%*`\$`!`(`(\$` ?=H`CD9F5H-CB`E`I`5@=75H-CB`HF`I`GD97`A=7FC`7<B`
%*`\$`!`(`(\$` ?=@G`5GGMHFI`GD97`A=7FC`7<BG`&&\$J`I`B=E`I`9`GI`6`
%*`\$`!`(`(\$` ?=@G`5GGMHFI`GD97`A=7FC`7<BG`&&\$J`I`B=E`I`9`GI`6`
%*`\$`!`(`(\$` ?=@G`5GGM`I`FB579`8I`5@K`#75D`A=7FC`
%*`\$`!`(`(\$` ?=@G`5GGM`I`FB579`8I`5@`
%*`\$`!`(`(\$` ?=H`F9D@HMD9!`?`H<FA`7D@9`HFI`GD97`A=7FC`
%*`\$`!`(`(\$` ?=H`I`D`F589`G95@79@H7`BCB!<95H98`
%*`\$`!`(`(\$` ?=H`F9;`I`@5HCF`B9FH`5G`7;`5`),`\$`

† DUW_YX`UbX`g\`ddYY`gYdUfUhY`m]b`h\`Y`I`"G"5``Bch`]bW`XYX`k`j\`]bhYfbUh]cbU`g\`da`Ybhg`Xi`Y`hc`
g\`dd]b[`fY[i`Uh]cbg``H\`YgY`]hYa`g`UfY`YggYbh]U`Zcf`cdYfUh]cb``7cbhUW`mci`f`@97C`X]ghf]Vi`hcf`Zcf`
ei`chUh]cb`UbX`XY`j`Yfm`

Components and Accessories List

625-511-145 Accessory Pack CHN Micro

%) \$&! \$& : I BB9@E I =7? '8=G7 'HI 69
%) \$&! \$(..... F 95; 9BH'B '75H5@MGH') \$;
%) \$&! \$- & G5A D@9'75@98H5') \$;
&) \$&! % - 7CDD9F 'GH=7?G '89CL=8=N98 '%\$; '5A DCI @9
%) \$&! % \$ 7CDD9F 'CL=89'K =F 9'D7G '%\$;
%) \$&! &\$+ G5A D@9'7MGH=B9'&" +D7H'G);
%) \$&! &\$- G5A D@9'GI @ 5A 9H<5N=B '%") D7H'G);
% * \$%d - * 75DGI @9'H=B ") L(L "%A A ') (A; '%\$\$#D?
% * \$%d - * (..... D@9F ' >5K "\$* &L ", +) L) "\$\$
%\$ * \$, !\$, - C!F=B; '%% * &L ""+(, L "\$- ' 5
% * \$, !' +- GHF =D'E I 5F HN'K CC@%) =B '%\$#D?
(..... * %*!% , C!F=B; '&&%'%"(' +L '%* , +L "%&) G
% * %*!%(+ 5GGMHI 69 '@5B79I 'A 57FC
% * %*!\$*) HI 69'I : I FB579'8I 5@
% * %*!%) (..... HI 69'75H5@MGH<95H9F
% * %*!(& HI 69'; @5GG'GHF 5= <H: =@H9F
% * %*!+& GD5HI @5'A =7FC ''&A A L '%&7A '@
% * %*!+&* : CF 79DG ' + "%+A A 'L "\$%A A 'L %%")
% * %*!+* 6FI G<'9L<5I GH'HI 6=B; '7@95B=B;
% * %*!++* HI 69'F95; 9BH'G97CB8 '@C58 'HCD
& * %*!+++ HI 69'A =88@9'8=F 97H=B;
%\$ +\$&!)) + C!F=B; '%& '%%" L "%" * * L "\$- ' G
% +*' !&* K CC@; @5GG'") \$#@6
% ++, !' &% 5GGMHCC @@5B79'9LHF 57HCF
% +-!) %' C!F=B; '%) '%"- ' +L '&"%& L "\$- ' J
% +, -!*& \$ 5GGMHCC @K CC@9LHF 57HCF
% * %*!% & 5GGMHCC @7FI 7=6@9'9LHF 57HCF
% * %(% !- * %d %\$ 7FI 7=6@9'DCFCI G: D!) &, '%\$#D?
% * %*!%(* HI 69 '@5B79I 'E I 5F HN
& * %*!%\$ =BGI @5HCF '7CA6I GH=C B 'HI 69
%) \$% &(% @ 6'; F95G9'J57I I A) "" CN
% * % !, \$- HI 69'6CFG: =@H9F ' ""* ' L '%%"(\$
% * &) !) %& %() 7FI 7=6@9'DCFCI G'A =7FC '@CK 9F ') #D?
%) \$&! *) * 7CDD9F 'HI FB=B; G'89; 5GG98 '*\$;
% * ' !%\$' !& 7CADCI B8 '5BH=G9=N9'(CN'HI 69

625-511-146 Accessory Pack CHNS Micro

%) \$&! \$& : I BB9@E I =7? 8=G7 HI 69
%) \$&! \$(- F95; 9BH'B 75H5@MGH') \$;
%) \$&! \$- & G5A D@9 75@98H5) \$;
&) \$&! % - 7CDD9F GH=7?G 89CL=8=N98 %%\$; 5A DCI @9
%) \$&! % \$ 7CDD9F CL=89'K =F9'D7G %%\$;
%) \$&! &\$* 75DGI @9'G=@J 9F '(A A L' "&A A %%\$D?
%) \$&! &\$+ G5A D@9 7MGH=B9'&" +D7H'G);
%) \$&! &\$- G5A D@9 GI @ 5A 9H<5N=B %%") D7H'G);
%) \$&! (, - 7FI 7=6@9 DCFCI G'A =7FC %%\$D?
% * \$% - * (D@9F >5K "\$* &L ", +) L) "\$"
%\$ * \$, !\$, - C!F=B; %%") * &L ""+(, L "\$- ' 5
% * \$, !' +- GHF=D'E I 5FHN'K CC@%) =B %%#D?
% * %(! - * % %\$ 7FI 7=6@9 DCFCI G: D!) &, %%#D?
& * %* !%\$ =BGI @5HCF '7CA6I GH=CB HI 69
(..... * %* !% , C!F=B; &&% "%(' +L "%*, +L "%&) G
% * % - !\$* HI 69 I : I FB579'8I 5@
% * % - !% (HI 69 75H5@MGH < 95H9F
% * % - !(& HI 69 ; @5GG GHF 5= < H : =@H9F
% * % - ! +& GD5HI @5'A =7FC '&A A L %%&7A @
% * % - ! +&* : CF 79DG '+ "%+A A L "\$%A A L %%")
% * % - ! + ' * 6FI G< 9L < 5I GH HI 6=B; 7@95B=B;
% * % - ! ++ * HI 69 F95; 9BH'G97CB8 '@C58 HC D
& * % - ! +++ HI 69 A =88@9'8=F 97H=B;
%\$ +\$!)) + C!F=B; %%& %% L %% * * L "\$- ' G
% +* !&*) K CC@; @5GG ") \$#@6
% ++, !' &% 5GGMHCC @5B79'9LHF 57HCF
% +-!) % C!F=B; %%) %% - ' +L &"%& L "\$- ' J
% +, - !*& \$ 5GGMHCC @K CC @9LHF 57HCF
% * %* !%) & 5GGMHCC @7FI 7=6@9'9LHF 57HCF
% * % - ! ++ (5GGMHI 69 @5B79'A =7FC
%) \$% &(% @ 6 ; F95G9'J57I I A) " CN
% * % !, \$- HI 69 6CFG : =@H9F %%* L %%(\$
% * & !) %& % (7FI 7=6@9 DCFCI G'A =7FC '@C9F ') #D?
%) \$&! *) * 7CDD9F HI FB=B; G'89; 5GG98 '*\$;
% * !%\$!& 7CA DCI B8 5BH=G9=N9 (CN HI 69

630-210-070 Component Pack

%&) ' +!%\$' HI 6=B; : @L 'D@9'B ''%+\$=8L "\$(\$K
% * \$%\$ * - %\$% 5GGMHI 69'7: @9L ''%& =8 'L '%
% * %* !%\$' =BGI @5HCF '7CA6I GH=C B 'HI 69'
% * %+!) (, HI 69'6CFCG : =@H9F '%"\$ 'L '%''' -
% * %- !%) (HI 69'75H5@VGH < 95H9F
% * %- !' \$() 5GGM7CJ 9F '8I GH '75FCI G9@
% * %- !' ++ 5GGMD@5H9'6MD5GG
% * %- !+\$() 5GGM75FCI G9@A =7FC 'GH57? ' '\$
% * &\$!* ++ 756@9'5GGM75H) '% fF > () 'G< @8
% +* &! () , 5GGM7CBBF 'BI H - #%' !%, #'&) 7I 'H
% ++ !' \$() 5GGM7CBB97HCF 'K #F 9@9: < 9@4 A
% +, \$! (,) 5GGM7CBB97HCF 'B&
% +, \$!, ((5GGM<CG9'J 9GG9@DF 9GGI F9
% +\$- !, \$*! +&\$' 7CF8 'DCK 9F '5GGM, : H '%) 5#&) \$J
% +\$- !, \$*! , \$, F 979DH57@9'GB; @% 5 '&) \$J '6@?
% +\$- !, \$*! , \$- 7CJ 9F 'F 979DH57@9'GB; @GGH
% &\$!+%\$' A 5BI 5@=BGHF 'HFI GD97 'A =7FC

686-616 PC Tower HP Assembly

% * , *!)) & HCK 9F < D , \$\$; % 9@H9 = ! (' ' \$ 'K +
% * , *! * %* !%\$% B5A 9D@5H9 =8 'HFI GD97 'D7
% K 5FF! ' *) K 5FF5BHM%& 'ACB H < 'GH5B85F 8
% * \$- ! +, + D57? '7CA DCB 9BH 'HK F 'F 979D#ACI G9

Specifications

Instrument Range f4 & a [£

7UfVcb \$\$\$\$& hc %\$\$
<mXfc[Yb \$\$& hc) \$i
B]hfc[Yb \$\$& hc) \$i
Gi `Z f \$\$(\$ hc *) i
Cl m[Yb \$\$(\$ hc %\$\$

Precision Range f4 & a [£

7UfVcb 0% FG8 cf - \$\$%fk \]WYj Yf]g [fYUhYf£
<mXfc[Yb 0% FG8 cf - \$\$%fk \]WYj Yf]g [fYUhYf£
B]hfc[Yb 0% FG8 cf - \$\$%fk \]WYj Yf]g [fYUhYf£
Gi `Z f 0% FG8 cf - \$\$%fk \]WYj Yf]g [fYUhYf£
Cl m[Yb 0% FG8 cf - \$\$%fk \]WYj Yf]g [fYUhYf£

Analysis Time (approx.)

7#< #B (a]bi hYg
7#< #B #G (a]bi hYg
Cl m[Yb % a]bi hY

Nominal Sample Weight & a [

Detection Method

7UfVcb #<mXfc[Yb#Gi `Z f#Cl m[Yb ""Cdjh]a]nYXz`ck !bc]gYz bcb! X]gdYfg]j Y =bZUfYX fH£ UVgcfdh]cb
B]hfc[Yb Cdjh]a]nYXz`ck !Xf]ZvH\Yfa U`7cbXi Wm]]hmifH7£ W

Gas Requirements

7Uff]Yf < Y`ji a 'f- - - i 'di fY£'4 '') 'dg] f&"('VUf£ - %\$
7ca Vi gh]cb Cl m[Yb 'f- - - i 'di fY£'4 '') 'dg] f&"('VUf£ - %\$
DbYi a Uh]W 7ca dfYggYX U]f fbci fW'a i gh'VY c] UbX k UhYf ZYY£/ (\$ 'dg] f&"
VUf£ - %\$

Furnace FYg]ghUbW`Zi fbUW/Vch\ df]a UfmUbX UZhYfVi fbYf/i d'hc
%\$\$C7 f&%&C £

Autoloader \$ 'dcgjh]cbz ghUWUVY hc %&\$ 'gUa d'Yg

Operational Control A]Wcgczh`K]bXck g" !VUgYX gcZh UfY'cb YI hYfbU D7

Environmental Conditions

CdYfUh]b['HYa dYfUh fY %) C 7 hc' \$C7 f) - C; hc', * C; E;
<i a]X]hm" &\$I hc', \$I ž bcb! WtbXYbg]b[.

Electrical Requirements

8YhYfa]bUhcf" & \$J r fl- %\$I / Uh'a UI "cUXLż) \$#* \$<nžg]b['Y'd\UgYż%&5/
- ž) \$\$'6Hl #\fl t'

CI m[Yb '5XX! Cb" & \$J r fl- %\$I / Uh'a UI "cUXLż) \$#* \$<nžg]b['Y'd\UgYż% 5/
%(ž&\$ \$'6Hl #\fl t'

Physical Dimensions†

8YhYfa]bUhcf" %]b"
CI m[Yb '5XX! Cb" %)]b"
.

.

Weight (approx.)

=bghfi a Ybh" &) "V" fP%\$+ _[E;

G\]dd]b['K Y][\h" &) "V" fP%&- _[E;

.

† 5X1 gh]b['gUa d`Y'g]nY'a UmYI hYbX]bghfi a Ybh'fUb[Y"

†† 5j YfU[Y'ci hdi h'VUgYX'cb'bca]bU'cdYfUh]b['dUfUa YhYfg"

TM5'ck 'U'*!]bW - %) 'W E'a]b]a i a 'UWVgg'UfYU'UfcI bX'U''i b]hg"

J r 'XYbchYg'J 57"

2 Installation

H\]g`WU UdhYf`]ghg`ghYd! Vm\ ghYd`]bghfi W\]cbg`hc`]bghU`h\ Y`Hfi GdYW\`7< B#7< BG#A]Wc`
7UfVcb#<m\fc[Yb#B]hfc[Yb#Gi `Z f`8YhYfa]bUhcfg``: cf`gcZhk UfY`gYh d`UbX`
W\]bZ[i fUh]cb\`fYZf`hc`GmghYa`GYh d\`dU[Y`(&%)



During installation and operation of this instrument, the ON/OFF switch must be easily accessible.

=`i ghfUh]cbg`&*&
@Zh]b[`UbX`A cj]b[`h\ Y`bghfi a Ybh`&*&
=bghU`]b[`h\ Y`bghfi a Ybh`&(*
=b\YfbUh]cbU`=bghU`Uh]cb`&*
7ca Vi gh]cb`Hi VY`&*
=bghU`]b[`h\ Y`7fi W\]Y`&*,
DUW_]b[`h\ Y`FYU[Ybh`Hi VY`&%\$
FYa cj U`&%\$
DUW_]b[`&E%\$
=bghU`Uh]cb`&E%\$
=bghU`]b[`h\ Y`7ca di hYf`&E%&
8UhU`HfUbga]h=bg\U`Uh]cb`&E%
5dd`m]b[`Dck Yf`&E%(
7Uff]Yf`; Ug`A Ub]Zc`X`DfYggi fY`GYh]b[`&E%)
GYh]b[`h\ Y`7Uff]Yf`; Ug`A Ub]Zc`X`A YUgi fY`DfYggi fY`&E%)
GYh]b[`h\ Y`7Uff]Yf`; Ug`DfYggi fYg`Uh`5`h]h XY`&E%*

Illustrations

:][i fY'&! %: UW]hmFYei]fYa Ybhg'&E+
:][i fY'&! & '@UbW`bgHU`Uh]cb'&E,
:][i fY'&! '7fi WYW`bgHU`Uh]cb'&E-
:][i fY'&! ('FYU[YbhHi VY'DUW_]b['&E%
:][i fY'&!) '6chca 'FY[i 'Uhcf'&E%*

Lifting and Moving the Instrument



CAUTION → Refer to [Specifications](#), page 1–30, for the approximate shipping and instrument weight. To lift or move the instrument, use equipment capable of safely lifting this weight.

%" DfcdYf'mX]ghf]Vi hY'k Y][\h'df]cf'hc'']Z]b["

Front panels and other cosmetic parts of this instrument are not designed to be weight bearing. DO NOT use such parts as lifting points, or damage may result. ALWAYS lift near the feet at the sides or the rear of the instrument base.

&" Dcg]h]cb ']bghfi a Ybh']b 'U`cVWh]cb 'Wbj Yb]Ybh'hc'dck Yf'UbX'[Ug'gi dd']Ygž' dfcj]X]b['U'a]b]a i a 'UWYgg'gdUW'cZ*']bWYg'Ufc i bX'h\Y']bghfi a Ybh''H\Y' `cVWh]cb 'Zf'h\Y']bghfi a Ybh'a i gh'Ugc'VY'UXYe i UhY'mfUhYX'hc'gi ddcfh'h\Y'k Y][\h' cZ'h\Y']bghfi a Ybh'UbX'U'UWYggcf]Yg'"

Installing the Instrument

H\Y\Zc\ck]b['dfc\WXi fY\ci 'X\VV'i gYX\Zcf\Zfgh\hja Y\]bghU\Uh]cb\cZ\h\Y\]bghfi a Ybh\H\g\dfc\WXi fY\Uggi a Yg\h\Uh\h\Y\]bghfi a Ybh\Ug\VVYb\i bdUW\YX\UbX\dcg\h]cb\YX\]b\]hg\dyfa UbYbh\cW\h]cb\''

H\Y\VV\UbW\UbX\df]b\hYf\UFY\bch\gi dd\]YX\k\]h\h\Y\]bghfi a Ybh\H\Yma i gh\VV\di fW\UgYX\gYdUf\Uh\m\''FYZf\hc\''Cd\h]cb\g\z\du[Y\%E*''

FYZf\hc\''

:][i fY\&!\%z\du[Y\&E+žXi f]b[']bghU\Uh]cb\cZ\h\Y\]bghfi a Ybh\''

%":Dfcj]XY\U'k cf_\gi f\ZUW\k\]h\W\bj Yb]Ybh\Y\Y\W\W\dck Yf\UbX\Ug\gi dd\]Yg\''FYZf\hc\''

&":][i fY\&!\%z\du[Y\&E+žZcf\dck Yf\UbX\Ug\gi dd\mfYei]fYa Ybh\''

'":=bghU\h\Y\=bghfi a Ybh\i g]b['h\Y\]bZfa Uh]cb\]b\''

(':][i fY\&!\%z\du[Y\&E+"Dfcj]XY\U'a\]b]a i a \gdUW\cZg\l\]bW\Yg\Ufc\i bX\h\Y\]bghfi a Ybh\Zcf\U]fZck\''



WARNING

HIGH VOLTAGE HAZARD

This equipment operates from a 230V~ source. Contact with this voltage can be fatal. Do NOT connect the instrument to the facility power source until instructed to do so.

)":7cbbYW\h\Y\57\dck Yf\WtfX\gi dd\]YX\k\]h\h\Y\]bghfi a Ybh\h\c\h\Y\dck Yf\Wt\bj YW\cf\cb\h\Y\fYUf\cZ\h\Y\]bghfi a Ybh\8C\BCH\di\[\]h\]b\c\ZUW\]h\mid\ck Yf\':cf\]bghU\Uh]cb\ci hg]XY\h\Y\i "G"5"\''FYZf\hc\''=b\hYfb\Uh]cb\U\''=bghU\Uh]cb\z\du[Y\&E*''

*":F Ya cj Y\h\Y\=b\Wta\]b[<Y\j a :\`ck 'G\W\i VVYf\UbX\5\jei ch\8cgY\`ck 'G\W\i VVYf\fYU\Ybh\h\Y\Yg\Zca\h\Y\Ug\du\UbY\cZ\h\Y\]bghfi a Ybh\UbX\duW\h\Ya\''FYZf\hc\''DUW\]b['h\Y\Y\YU\Y\Ybh\h\Y\Y\z\du[Y\&E\%''

+":DUW\h\Y\5b\mXfcbY\''Hi\Y\Y\''FYZf\hc\''DUW\]b['h\Y\5b\mXfcbY\''Hi\Y\Y\z\du[Y*E\''

,":=bghU\h\Y\Wta di h\Yf\bjYUf\h\Y\]bghfi a Ybh\''FYZf\hc\''=bghU\]b['h\Y\7ca di h\Yf\z\du[Y\&E\%&\''

-":=bghU\h\Y\VV\UbW\UbYUf\h\Y\Wta di h\Yf\UbX\]bghfi a Ybh\''FYZf\hc\''=bghU\]b['h\Y\6U\UbW\z\du[Y\''E\''



CAUTION

POSSIBLE OPERATOR INJURY

Oxygen is not recommended in the pneumatic systems of LECO instruments. If a spark is present, an explosion may result.

%%":7cbbYW\h\Y\Cl m[Yb\Hi\Y\]b['5ggYa Vm\Zca\h\Y\cl m[Yb\h\Ub_\h\c\h\Y\cl m[Yb\Z\h\]b['cb\h\Y\fYUf\cZ\h\Y\]bghfi a Ybh\''

%%"G\]XY\h\Y\Z\h\]b['VUW\Zca\h\Y\Y\XX[Y\cZ\h\Y\h\Y\]b['UbX\di\g\h\Y\h\Y\]b['b\h\c\h\Y\cl m[Yb\dcf\h\cZ\h\Y\]bghfi a Ybh\h\Y\Y\g\]XY\h\Y\bi\h\hck UfX\h\Y\]bghfi a Ybh\UbX\gW\Yk\]h\cb\h\c\h\Y\]bghfi a Ybh\dcf\h\H\]h\Y\h\Y\bi\h\''

%&":Hi\fb\h\Y\cl m[Yb\Ug\cb\Uh\h\Y\h\Ub_\UbX\gYh\]h\h\c\''dg\]f\&"(%\VUf\''

%":7cbbYW\h\Y<Y\j a 'Hi\Y\]b['5ggYa Vm\Zca\h\Y\Y\]j a 'h\Ub_\h\c\h\Y\Y\]j a 'Z\h\]b['cb\h\Y\fYUf\cZ\h\Y\]bghfi a Ybh\''

% " G]XY h\Y Zjhjb['VUW_Zfca h\Y YX[Y'cZ h\Y h\ V]b['UbX di g\ h\Y h\ V]b[']bhc h\Y
 \Y]jia 'dcfh cZ h\Y]bghfi a Ybh' H\Yb'g]XY h\Y bi h\hck UfX h\Y]bghfi a Ybh' UbX
 gWYk]h\cbhc h\Y]bghfi a Ybh'dcfh' H][\h\Yb h\Y bi h'
 % " Hi fb h\Y Y]jia [Ug'cb Uh'h\Y h\Ub_ 'UbX'gYh]h\hc") 'dg]f&"(%'VUfL"
 %* " 7cbbYW h\Y DbYi a Uh]WHi a Uh]WbYi a Uh]WbUb_ 'hc h\Y
 dbYi a Uh]Wb]b Zjhjb['cb h\Y fYUf'cZ h\Y]bghfi a Ybh'
 %+ " G]XY h\Y Zjhjb['VUW_Zfca h\Y YX[Y'cZ h\Y h\ V]b['UbX di g\ h\Y h\ V]b[']bhc h\Y
 dbYi a Uh]Wdcfh'cZ h\Y]bghfi a Ybh' H\Yb'g]XY h\Y bi h\hck UfX h\Y]bghfi a Ybh' UbX
 gWYk]h\cbhc h\Y]bghfi a Ybh'dcfh' H][\h\Yb h\Y bi h'
 % " Hi fb h\Y dbYi a Uh]W[Ug'cb Uh'h\Y h\Ub_ 'UbX'gYh]h\hc' (\$'dg]f&"+* 'VUfL"
 %- " =bghU' U'WfI WYWY]bhc h\Y]bhc h\Y Wfa Vi gh]cb h\ VY" FYZYf'hc"
 =bghU']b[h\Y 7fi WYWY]dU[Y'&E, "



CAUTION

POSSIBLE OPERATOR INJURY

The exhaust gas must be exhausted away from the work area and should not be vented into the lab. Connect the exhaust ports to the lab exhaust system or a fume hood.

&\$" 7cbbYW h\Y H7 W``UbX'a U]b'YI \Ui gh'dcfhg'hc h\Y UV'YI \Ui gh'gmghYa "8C'BCH'
 WbbYW h\Y YI \Ui gh'dcfhg'hc[Yh\Yf'UbX h\Yb'WbbYW h\Y Ya 'hc h\Y UV'YI \Ui gh"
 ; Ug'Zfca h\Y a U]b'YI \Ui gh'a i gh'bch'Zck 'VUW_]bhc h\Y H7 W``YI \Ui gh"
 &%" =bghU' h\Y I G6 WYWY]fca h\Y Wfa di h\Yf'hc h\Y]bghfi a Ybh' FYZYf'hc"
 8Uh]HfUbga]h=bgH'Uh]cb]dU[Y'&E%"
 &&" D'i [h\Y]bghfi a Ybh]bhc ZWY]hm57 dck Yf" 8c'bch'fb h\Y]bghfi a Ybh'cb i bh]
]bghfi WYWX'hc'Xc'gc"
 &" H\]g'Wfa d'YhYg]bghfi a Ybh]bghU'Uh]cb" 6YZcfY Wbh]bi]b['k]h'cdYfUh]cb]fYZYf'
 hc'GmghYa 'GYh d]dU[Y' (E%"

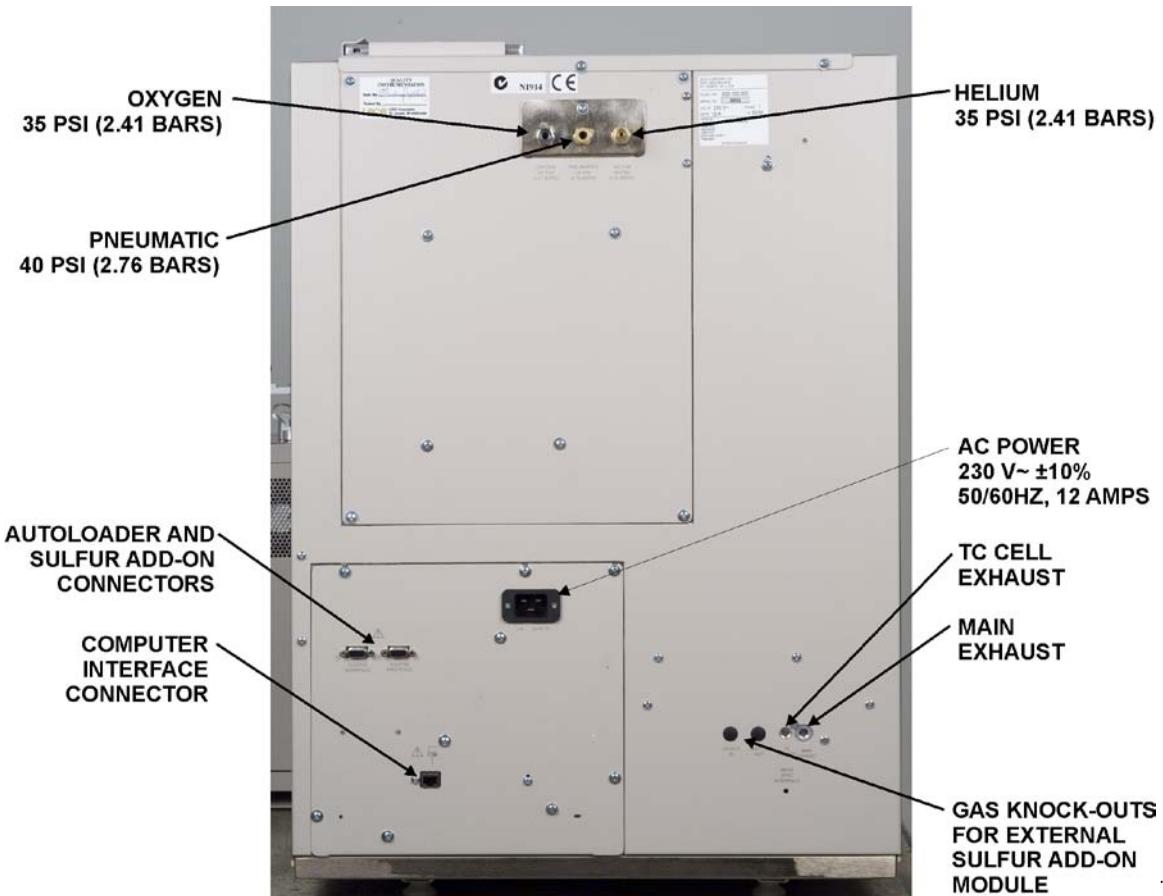
International Installation

: cf]bhYfbUh]cbU`]bghU``Uh]cbz` U` < 5F `Uddfcj YX`]bY` WtfX` Zcf` i gY`]b` hY` Y` YbX` Wt` bbfmi
a i gh` VY` cVhU]bYX`` H`]g` dfcXi W` fYei]fYg` U` X]gW` bbYW` XYj`]W` h` Uh` a` Um` Y]h` Yf` VY` h` Y`
d` i` [` cZ` h` Y` dck` Yf` W` fX` cf` U` X]gW` bbYW` XYj`]W`]bghU` YX` Uh` h` Y`]bghU` Uh]cb` g]h`]Z` h` Y`
Yei`]da` Ybh`]g` dYfa` UbYbh` m` W` bbYW` XYj`]W` fYg` W` Ug`

K` Yb` h` Y` d` i` [` cb` h` Y` dck` Yf` gi` dd` m` W` fX`]g`]bhYbXYX` hc` gYfj` Y` Ug` h` Y` X]gW` bbYW`
XYj`]W` h` Y` gcW` Yh` ci` h` Yh` a` i` gh` VY`]bghU` YX` b` YUf` h` Y` Yei`]da` Ybh` UbX` g` U` VY` YUg`]m`
UW` Ygg` V` Y` K` \Yb` h` Y` k`]f]b[` g` dYfa` UbYbh` m` W` bbYW` XYj`]W` fYg` W` Ug`
U` W` fW`]h` VfYU` _Yf` cf` gk`]h` a` i` gh` VY` c` W` UV` Yj`]bghU` YX` b` YUf` h` Y` Yei`]da` Ybh` UbX` VY`
YUg`]m` UW` Ygg` V` Y`

Combustion Tube

H` Y` W` a` Vi` gh]cb` h` VY` gi` dd`]YX`]b`]bghfi` a` Ybh` g` di` fW` UgYX` Zcf` Xca` Ygh]Wi` gY`]g` dUW` YX`
VY` ZcfY` g`]da` Ybh` Zfc` h` Y` ZUW` cfm` =bghfi` a` Ybh` g` di` fW` UgYX` Zcf`]bhYfbUh]cbU` i` gY` a` Um`
bch` \Uj` Y` h` Y` W` a` Vi` gh]cb` h` VY` dUW` YX` =Z` h` Y` W` a` Vi` gh]cb` h` VY`]g` bch` dUW` YX` fYZf` hc`
DUW`]b[` h` Y` 7ca` Vi` gh]cb` h` VY` z` dU[` Y` * E` %&z` UbX` dUW` h` Y` W` a` Vi` gh]cb` h` VY`



Electrical Requirements

Electric power requirements:
 - 230V AC, 50/60Hz, 12A
 - 24V DC, 10A
 - 12V DC, 10A
 - 5V DC, 10A
 - 3.3V DC, 10A
 - 1.8V DC, 10A

Gas Required

Gas requirements:
 - Oxygen: 35 psi (2.41 bars)
 - Helium: 35 psi (2.41 bars)
 - Pneumatic: 40 psi (2.76 bars)
 - Air: 230V AC, 50/60Hz, 12A
 - Sulfur Add-on Module: 12V DC, 10A
 - Computer Interface: 5V DC, 10A
 - TC Cell Exhaust: 3.3V DC, 10A
 - Main Exhaust: 1.8V DC, 10A

Regulators

Regulators required:
 - Oxygen regulator: 35 psi (2.41 bars)
 - Helium regulator: 35 psi (2.41 bars)
 - Pneumatic regulator: 40 psi (2.76 bars)
 - Air regulator: 230V AC, 50/60Hz, 12A
 - Sulfur Add-on Module regulator: 12V DC, 10A
 - Computer Interface regulator: 5V DC, 10A
 - TC Cell Exhaust regulator: 3.3V DC, 10A
 - Main Exhaust regulator: 1.8V DC, 10A

Figure 2-1
Facility Requirements

Installing the Crucible

%" F Ya cj Y'h\Y`cUX]b['\YUX'UbX'gYh]h'h\h\Y'g]XY" FYZf'hc'FYd'UV]b['h\Y'7fi W\W'Yz'
dU[Y'*E%+''

&" GWYk 'h\Y`UbW\YI hfUWcf'hcc'z'cW\hYX]b[h\Y]bg]XY'Zfcbh'Xccfz]bhc'cbY'cZh\Y'
h\YfYUXYX'\c'Yg]b[h\Y`UbW\UggYa V'm'UbX'fYa cj Y'h\Y`UbW\UggYa V'm'

' " =bgYfh'h\Y'W\Y'YI hfUWcf'hcc'']bhc'U'W\Y'UbX'ck Yf]h]bhc'h\Y'W\Y'Vi gh]cb'
h\YVY" FYZf'hc':][i fY'&I' z'dU[Y'&E- " FYgh'h\Y'W\Y'cb'h\Y'WddYf'cl]XY'
gh\Wg" FYYUgY'h\Y'W\Y'UbX'fYa cj Y'h\Y'YI hfUWcf'hcc'"

(" <c'X'h\Y`UbW\Vm'h\Y'fYa cj U'hcc'UbX'W\YfYZl 'm'ck Yf]h]b'd'UV]" bgWYk 'h\Y'
'UbW\YI hfUWcf'hcc'']h\Y'Vchca'cZh\Y'UbW\g\ci'X'VY'dcg]h]cbYX']bg]XY'h\Y'
hcd'cZh\Y'W\Y'V\WY'7\Y\W\U'[[ba Ybh'UbX'dcg]h]cb'VYZcfY'h\Y`cUX]b['\YUX']g'
]bghU'YX" FYZf'hc':][i fY'&I'&z'Zc'ck]b["

) " FY]bgH\U'h\Y`cUX]b['\YUX"

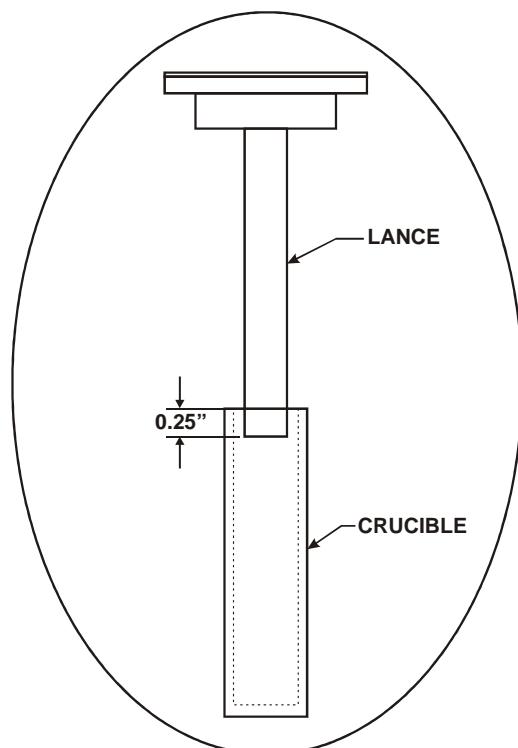


Figure 2-2
Lance Installation

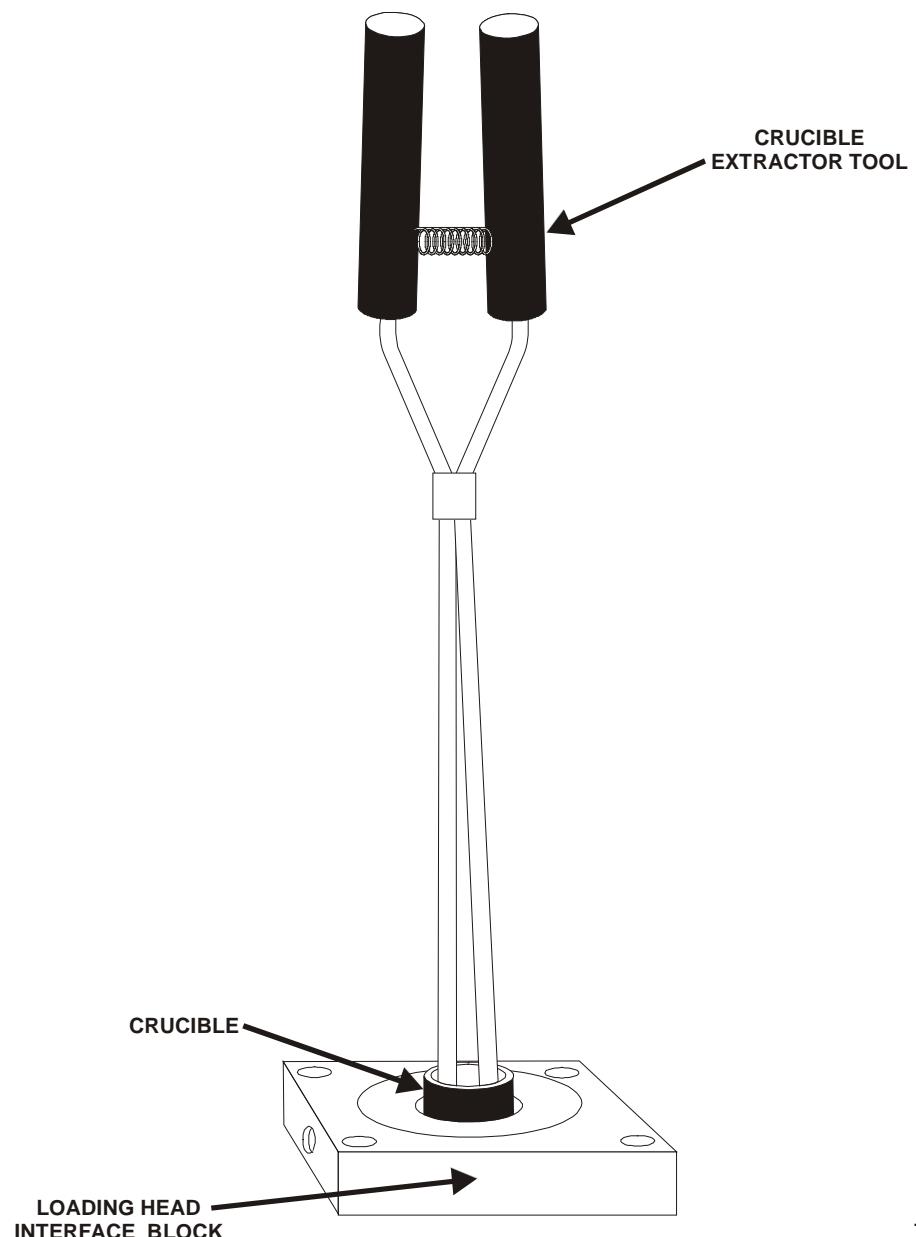


Figure 2-3
Crucible Installation

Packing the Reagent Tube



Anhydrene is a strong dehydrating agent and potentially strong oxidant over 150°C. Do not heat with organic matter, flammables or combustibles. Avoid contact with strong acids. Refer to Safety Data Sheet (SDS) for procedures.

Removal

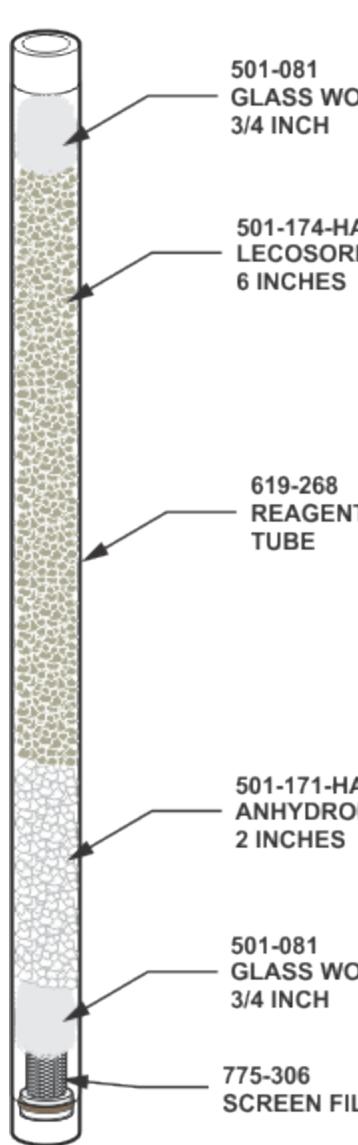
%" G`]XY`fYU[Ybh`H VY`i dk UfX`i bH` `h`Y`Vch`ca `YbX`Wb`gk]b[`ZYY"
&" H]h`ci h`h`Y`ZYY`fYU[Ybh`H VY`YbX"
* " Di ```h`Y`fYU[Ybh`H VY`Xck bk UfX`cZ`h`Y`hcd`dcfh"

Packing

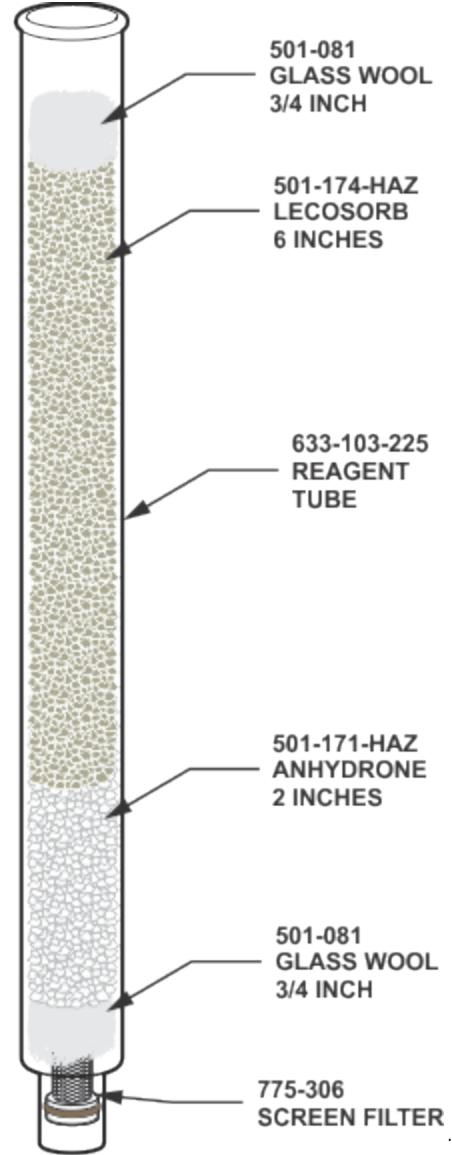
%" =bgYfh`U`gWYYb`Z`h`Y`f`]bhc`h`Y`Vch`ca `cZ`fYU[Ybh`H VY`Dcg]h]cb`h`Y`c! f]b[`hck UfX`
h`Y`Vch`ca `UbX`di g`h`Y`gWYYb`Z`h`Y`f`i d`]bhc`h`Y`h`VY`%#(!]bWk`z:][i fY`&! (ž`dU[Y`
&E%%"
&" DUW_`#(!]bW`cZ[`Ugg`k cc`]bhc`h`Y`Vch`ca `cZ`fYU[Ybh`H VY"
* " :]``h`Y`Vch`ca `%#`cZ`fYU[Ybh`H VY`k]h`Anhydrene"
(" :]``h`Y`hcd`%#`cZ`fYU[Ybh`H VY`k]h`@97CGCF6"
) " :]fa `mduW_`%#`h`c`#(!]bW`cZ[`Ugg`k cc`]bhc`h`Y`hcd`cZ`fYU[Ybh`H VY"
* " F Y]bghU```h`Y`fYU[Ybh`H VY"

Installation

%" Di g\`h`Y`hcd`YbX`cZ`h`Y`fYU[Ybh`H VY`c] Yf`h`Y`hcd`dcfh"
&" H]h`h`Y`fYU[Ybh`H VY`]bk UfX`UbX`di ```]h`Xck bž`di g\`]b[`]h`c] Yf`h`Y`Vch`ca `dcfh"



Aliquot Dose Scrubber



Incoming TC Carrier Gas Scrubber

Figure 2-4
Reagent Tube Packing

Installing the Computer

%" I bdUW_`h\Y`W\ta di h\Yf\z'a cb]hcf'UbX'df]bhYf"
&" GYh\h\Y`W\ta di h\Yf'bYUf`h\Y']bghfi a Ybh\z'UbX'gYh\h\Y'a cb]hcf'UbX'df]bhYf'bYUf`h\Y`W\ta di h\Yf"
'" 7ccbYV\h\Y'dck Yf'W\z'X'h\hUh]g\gi dd']YX'k]h\h\Y'a cb]hcf'hc`h\Y'dck Yf']bdi h`UW_`cb`h\Y'fYUf'cZ\h\Y'a cb]hcf'FYZYf'hc`h\Y'a Ubi U'gi dd']YX'k]h\h\Y'a cb]hcf"
(" 7ccbYV\h\Y'a cb]hcf'W\z'Y\z'gi dd']YX'k]h\h\Y'a cb]hcf\z'hc`h\Y'a cb]hcf'W\z'bbYV\h\Y'cb`h\Y'fYUf'cZ\h\Y`W\ta di h\Yf"
) " @cW\hY`h\Y']bghfi a Ybh]bhYfZUW'W\z'Y'UbX'W\z'bbYV\h\Y]h'hc`h\Y']bghfi a Ybh'W\z'bbYV\h\Y'f\h\YfbYh\z'cb`h\Y'fYUf'cZ\h\Y`W\ta di h\Yf" 7ccbYV\h\Y'ch\Yf'YbX'hc`h\Y`W\ta di h\Yf'W\z'bbYV\h\Y'f\h\YfbYh\z'cb`h\Y'fYUf'cZ\h\Y']bghfi a Ybh'FYZYf'hc"
* " :][i fY' &! %& dU[Y' &E+ "
+" @cW\hY`h\Y'_Ym\cUfX\z'gi dd']YX'k]h\h\Y`W\ta di h\Yf\z'UbX'gYh]h]b`Zfc\h\cZ\h\Y'a cb]hcf" 7ccbYV\h\Y'_Ym\cUfX'W\z'Y'hc`h\Y'_Ym\cUfX'W\z'bbYV\h\Y'cb`h\Y'fYUf'cZ
h\Y`W\ta di h\Yf"
, " @cW\hY`h\Y'a ci gY\z'gi dd']YX'k]h\h\Y`W\ta di h\Yf\z'UbX'gYh]h'bYI h'hc`h\Y'_Ym\cUfX" 7ccbYV\h\Y'a ci gY'W\z'Y'hc`h\Y'a ci gY'W\z'bbYV\h\Y'cb`h\Y'fYUf'cZ\h\Y`W\ta di h\Yf" h\Y'A ci gY'DUX'g\ci 'X'VY'dcg]h]cbYX' i bXYf`h\Y'a ci gY"
- " 7ccbYV\h\Y'dck Yf'W\z'X\z'gi dd']YX'k]h\h\Y'df]bhYf'hc`h\Y'dck Yf']bdi h'W\z'bbYV\h\Y'cb`h\Y'fYUf'cZ\h\Y'df]bhYf'FYZYf'hc`h\Y'a Ubi U'gi dd']YX'k]h\h\Y'df]bhYf"
%\$" 7ccbYV\h\Y'df]bhYf'W\z'Y'hc`h\Y'W\z'bbYV\h\Y'cb`h\Y'fYUf'cZ\h\Y'df]bhYf" 7ccbYV\h\Y'ch\Yf'YbX'cZ\h\Y'df]bhYf'W\z'Y'hc`h\Y'df]bhYf'W\z'bbYV\h\Y'cb`h\Y'fYUf'cZ\h\Y`W\ta di h\Yf'f\h\Ymd]W\z'm\h]g'k]`VY'U'I G6'W\z'VY'Y\z"
%%" @cW\hY`h\Y'W\z'dmidfch\YV\h\Y'cb'_Ym\UbX'd'i [']'h]bh\c'cbY'cZ\h\Y'I G6'W\z'bbYV\h\Y'cfg'cb`h\Y'VUW'_cZ\h\Y`W\ta di h\Yf"
%&" FYZYf'hc`h\Y'a Ubi U'gi dd']YX'k]h\h\Y'df]bhYf'UbX']bghf\h\Y]b_`W\z'ff]X[Yg'`b`h\Y'df]bhYf'UbX'U'][b`h\Y'a "
%" Hi fb'Cb`h\Y`W\ta di h\Yf'UbX'k Ujh\z'cf`h\Y'cdYfUh]b[`gmghYa`hc`cUX"GY`YV\h\Y'cb`h\Y'TruSpec`=W\h\Y'UbX'Zc`ck`h\Y'fY[`ghfUh]cb']bghfi W\h\Y'cbg`h\hUh'UddYUf'cb`h\Y'X]gd'Um'A U_Y'gi fY`h\Y'TruSpec'Udd']W\h\Y'cbg'dfc[fUa`Ug`cUXYX'UbX`h\Y'dfc[fUa`UddYUf'cb`h\Y'X]gd'Um'VYZcfY'W\h\Y'bi`jb["
%(" 5'][b`h\Y']b_`W\z'ff]X[Yg'UZ\h\Yf`h\Y`W\ta di h\Yf'UbX'df]bhYf'\Uj Y'VYYb`h fbYX'cb" FYZYf'hc`h\Y'a Ubi U'gi dd']YX'k]h\h\Y'df]bhYf'Zcf`h\Y'U'][ba Ybh]bghfi W\h\Y'cbg"

Data Transmit Installation

NOTES →

- H\Y\XUhU\ci hdi h\g\FG! & " "
 - 5``\W\UfUV\WYf\ [YbYfUh]cb\]g\WXYX\]b\5G7=cf\ B=7C89\Zcfa Uh"
 - GdYV\U\W\UfUV\WYfg\fgj\ W\Ug\YI dUbXYX\df]bh\W\UfUV\WYfg\UfY\Z\hYfYX\ci h"
- %" 7cbbYV\h\Y\XUhU\hfUbga]h\WbbYV\cf\cb\h\Y\W\ta di h\Yf\hc\h\Y\gYf]U\WbbYV\cf\cb\h\Y\dYf]d\YfU\XYj]W"
- &" 7cbZ[i fY\h\Y\]bg\hfi a Yb\h\g\ci hdi h\hc\ a Uh\W\h\Uh\cZ\h\Y\dYf]d\YfU\XYj]W" FYZYf\hc\7ca a i b]W\h]cb\GY\h]b[g\z\du[Y) \E*%ž\Zc\h\Y\W\h]bZ[i fUh]cb\dfc\W\Xi fy"
- " " Hc\hfUbga]h\XUhU\Ui hca Uh\W\m\z\fYZYf\hc\5i hca Uh]cb\z\du[Y) \E*\$"

Applying Power

%" H\Y'Dck Yf'Gk]h\W'cb 'h\Y'YZh'g]XY'cZh\Y'XYhYfa]bUhcf'g\ci 'X'VY']b 'h\Y'cZz' dcg]h\cb"

&" Hi fb 'h\Y'; Ug'Gi dd']Yg'cb 'Uh'h\Y'fY[i 'Uhcfg"

NOTE → =b 'h\Y'Zc``ck]b['ghYdg'z'h\Y'XYhYfa]bUhcf'UbX'Wta di h\Yf'a i gh'VY'hi fbYX'Cb"

' " Hi fb 'Cb'57'dck Yf'hc 'h\Y'XYhYfa]bUhcf"DYfa]h'h\Y'Wta di h\Yf'hc 'VccH'i d'UbX'fi b' h\Y'Udd']W\h]cb'dfc[fUa "

(" 5``ck 'h\Y'hYa dYfUhi fY'hc 'ghUV']nY'Zcf'cbY'\ci f'VYZcfY'dYfZcf]b['U'gmghYa ' W\Y\W'cf'gUa d'Y'UbU'mg]g"

) " 5W\gg'h\Y'Ua V]Ybh'a cb]hcf"FYZYf'hc '5a V]Ybh'7\Ufh'z'dU[Y', E' "

* " J Yf]Zm'h\Uh'h\YfY'UfY'bc 'U'Ufa g']bX]W\hYX'VmUb'YI'WUa Uh]cb'a Uf_Yf]b 'U'mY'`ck ' Vcl 'hc 'h\Y'YZh'cZh\Y'dUfUa YhYf'5``'U'Ufa g'a i gh'VY'WUfYX'VYZcfY'dYfZcf]b['U' gUa d'Y'UbU'mg]g" 'Hc 'W\YUf'Ub 'U'Ufa ']h'a Um'VY'bW\ggUfm'hc 'dYfZcf ' \UfXk UfY' W\]VfU]cb'z'gmghYa 'a U]bhYbUbW'cf'k U]h'Ub 'Uddfcdf]UhY'Ua ci bh'cZh'a Y'Zcf'hc ']bgfhi a Ybh'hc 'k Ufa ! i d"FYZYf'hc 'h\Y'8]U[bcgh]W'UbX'GYfj]W'GYW]cb'cZh'g' a Ubi U'Zcf'a cfY']bZcf a Uh]cb"

Carrier Gas Manifold Pressure Setting

Hi Y' Wff]Yf' [Ug'a Ub]Zc'X'Wbhfc'g'h Y' Wff]Yf' [Ug'dfYggi fY'cb'Vch' h Y'a YUgi fY'UbX' fYZYfYbW'g]XYg'cZh'Y'H7'W'''H Y' Wff]Yf' [Ug'a Ub]Zc'X']g'cWWhYX'cb' h Y'YZh'g]XY'cZ' h Y'i b]h'FYa cj Y'h Y'Yzh'dUbY'hc'UWgg'h Y'a Ub]Zc'X'''

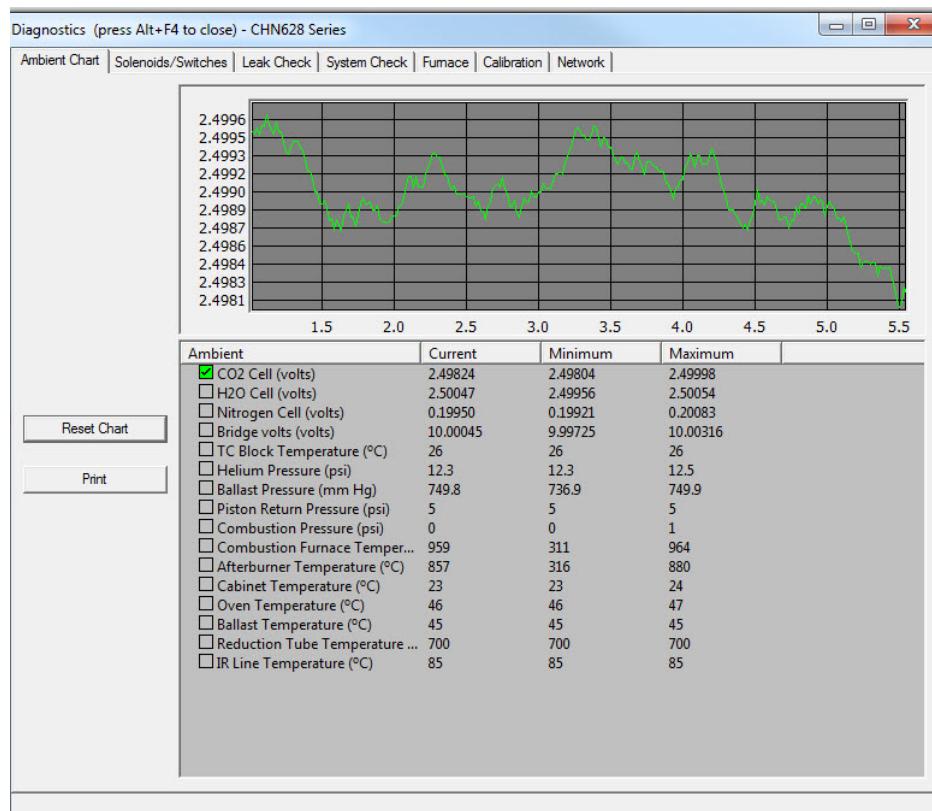
NOTE → Hi Y' Wff]Yf' [Ug'a Ub]Zc'X'dfYggi fY'bYYXg'hc'VY'gYh'Uh'%&'dg] Zcf'Vch' h Y'a YUgi fY' UbX' h Y'fYZYfYbW' H Y'dfYggi fY']g'gYh'Xi f]b[]b]h]U'gYh' d'Vm@97C'Vi h g\ci 'X'VY' W YWYX'Xi f]b[]bghU'Uh]cb'''

Setting the Carrier Gas Manifold Measure Pressure

Hi fb' h Y'a YUgi fY'dfYggi fY'_bcV'i bh' h Y'dfYggi fY'cb' h Y'X]U']g'Uh'%&'dg]" FYZYf'hc' :][i fY'&!) ž'dU[Y'&E%*'"

NOTE → Hi Y'fYZYfYbW'dfYggi fY']g'a cb]hcfYX']b' h Y'gcZh'k UfY'''

%" =b' h Y'7< B*&, 'gcZh'k UfYž'gY'YWh'8]U[bcgh]W' UbX' h Yb'gY'YWh'7\Ufh'''



&" 7\YW\h\Y<Y]i a 'FYZYfYbW'DfYggi fY'f\bg]L'cf'5f[cb 'FYZYfYbW'DfYggi fY'f\bg]L'
 Vcl ž'UbX'h fb 'h\Y'fYZfYbW'_bcV'i bh]'h\Y'fYZfYbW'dfYggi fY'f\bg]L'fYUXg '%&'dg]"

Ambient	Current	Minimum	Maximum
<input type="checkbox"/> CO2 Cell (volts)	2.49729	2.49685	2.49998
<input type="checkbox"/> H2O Cell (volts)	2.49958	2.49921	2.50058
<input type="checkbox"/> Nitrogen Cell (volts)	0.19759	0.19703	0.20083
<input type="checkbox"/> Bridge volts (volts)	10.00187	9.99725	10.00394
<input type="checkbox"/> TC Block Temperature (°C)	26	26	26
<input checked="" type="checkbox"/> Helium Pressure (psi)	12.3	12.3	12.5
<input type="checkbox"/> Ballast Pressure (mm Hg)	749.9	736.9	750.0
<input type="checkbox"/> Piston Return Pressure (psi)	5	5	5
<input type="checkbox"/> Combustion Pressure (psi)	0	0	1
<input type="checkbox"/> Combustion Furnace Temper...	954	311	968
<input type="checkbox"/> Afterburner Temperature (°C)	870	316	880
<input type="checkbox"/> Cabinet Temperature (°C)	23	23	24
<input type="checkbox"/> Oven Temperature (°C)	46	46	47
<input type="checkbox"/> Ballast Temperature (°C)	45	45	45
<input type="checkbox"/> Reduction Tube Temperature ...	700	700	700
<input type="checkbox"/> IR Line Temperature (°C)	85	85	85

Setting the Carrier Gas Pressures at Altitude

%" Hi fb 'CZZ' [UgYg'Uh'h\Y'fY[i 'Uhcfg'"
 &" =b 'h\Y'7<B*&, 'gcZhk UfYž'gY'YW\8]U[bcgh]W'UbX'h\Yb'gY'YW\5a V]Ybhg'A cb]hcf'"
 ' " 5`ck 'h\Y'W\ff]Yf' [Ug'hc'fYUW'U'a]b]a i a 'dfYggi fY''BchY'h\g'a]b]a i a ''
 (" FYa cj Y'h\Y'YZhg]XY'dUbY'"
) " Hi fb 'Cb' [UgYg'Uh'h\Y'fY[i 'Uhcfg'"
 * " Hi fb 'Cb' [UgYg']b'h\Y'gcZhk UfY'"
 + " I g]b['h\Y'Vchhca 'fY[i 'Uhcf'fIYZf'hc':][i fY'&!] ž'dU[Y'&É%* L'UbXž'k \]Y'k UhW]b['h\Y'Ua V]Ybh'a cb]hcfž'gY'h\Y'W\ff]Yf' [Ug'dfYggi fY'hc'UddfcI]a UhY'm%&'dg]- '\$") 'dg]UVcj Y'h\Y'a]b]a i a 'dfYggi fY'bchYX']b'ghYd'"

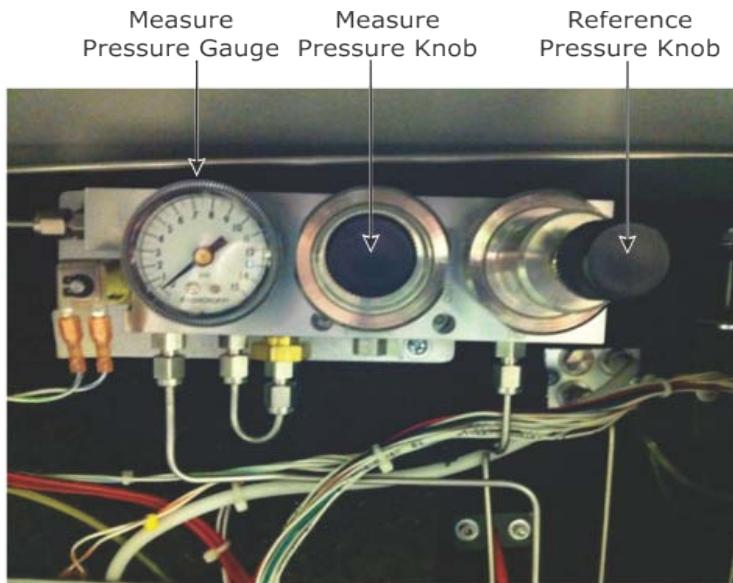


Figure 2-5
Bottom Regulator

, " GYh'h\Y'hcd'fY[i 'Uhcfž'g]b['h\Y'UbUc['X]gd'Um'cb 'h\Y'a Ub]Zc'Xž'hc'%"dg] ``Ygg' h\Ub'h\Y'W\ff]Yf' [Ug'dfYggi fY'"

3 Option Installation

Hñ]g'WU UdhYf'`]ghg'ghYd! VmI ghYd'`]bghf i W]cbg'hc'`]bghU'`cdh]cbU'`Yei]da Ybh'Zcf'hñY'
Hfi GdYW'`8YhYfa`]bUhcf'` cf'`gcZhk UfY'`gYh d'`UbX'`WbZ[i fUh]cbz'fYZYf'hc'`Gmghya`
GYh dž du[Y`(`E%`

=`i ghfUh]cbg`-----E`
=bghU`]b[`hñY`6U`UbW`-----E)
DfYdUf]b[`hñY`6U`UbW`-----E)
GYh]b[`hñY`8UhU`7\UfUWYfg`DUfUa YhYfg`-----E*
GYh]b[`I d`7ca a i b]Wb]cb`k`]h`6U`UbW`-----E*
=bghU`]b[`hñY`1`G6`8f]j`Yf`-----E*
GcZhk UfY`7cbZ[i fUh]cb`-----E-
HYgh]b[`hñY`6U`UbW`-----E%\$
FYgYh]b[`hñY`6U`UbW`-----E%\$
=bghU`]b[`hñY`Df]bhYf`-----E%%
GHUW_UV`Y`7Ufc i gY`g`-----E%&
TruSpec`CI m[Yb`5XX! Cb`-----E%)
9ei]da Ybh`DUW_U[Yg`-----E%)
*&, CHFGA`DUW_U[Y`Wb]gh]b[`cZ` * &, `CI m[Yb`TruSpec`8YX]Wb]YX`A`]Wc`-----E%)
*&, `C`A cXi`Y`7ca dcbybh`DUW_f` && \$- \$! \$+\$£`Wb]gh]ghg`cZ`-----E%)
*&, `CI m[Yb`TruSpec`8YX]Wb]YX`A`]Wc`5XX! Cb`DUW_f` * \$! \$%\$! %) \$£`
Wb]gh]ghg`cZ`-----E%*
*&, `CI m[Yb`TruSpec`8YX]Wb]YX`A`]Wc`5WYggcfmDUW_f` * \$! \$%\$! %) (\$`
Wb]gh]ghg`cZ`-----E%*
=b]h]U`=bghU`Uh]cb`-----E%+
CI m[Yb` : i fbUW`GW` VVYf`-----E%
=bghU`]b[`hñY`
DUW_`]b[`UbX`=bghU`]b[`hñY` : i fbUW`Hi` VYg`-----E&%

=bghU`]b[`h Y'8]j YfhYf`J U`j Y`UbX`G]XY`DUbY`----- E&
=bghU`]b[`h Y'8]j YfhYf`J U`j Y. ----- E&
@cUX]b[`<YUX`UbX`; Ug`@]bYg ----- E` \$
7cbj Yfg]cb`6UW`hc`7<B#7<BG ----- E`
DUW_]b[`h Y`C1 m[Yb`7UhU`mg`Hi`VY`----- E` (
CdYfUh]cb`----- E` *
7cbhfc`g`UbX`=bX]Wlhcfg`----- E` *
GYh d`----- E` +
GUa d`Y`DfYdUfUh]cb`----- E` -
GUa d`Y`5bU`mg]g`----- E` -
@YU_`7\YWz`*&, `C`A cXi`Y`----- E` (\$
DYf]cX]WA U]b`hYbUbWz`*&, `C`A cXi`Y`----- E` %
7`YUb]b[`h Y`G`X]b[`6`cW`UbX`@cUX]b[`<YUX`----- E` &
5X1 gh]b[`h Y`H]a`Yf`J U`j Y`----- E` (
5X1 gh]b[`h Y`H]a`Yf`J U`j Y`----- E` *
=`i ghfUh]cbgz`*&, `C`A cXi`Y`----- E` +

Illustrations

:][i fY' !% '6U'UbW'7cbhfc`'DUbY' E*

:][i fY' !& '7UfcI gY' 'CdYb' Dcg]h]cb E%&

:][i fY' !' '7UfcI gY' '6chca 'DUhY E%&

:][i fY' !('7UfcI gY' 'A ci bh]b['Dcg]h]cb E%

:][i fY' !) 'GHUW_YX' 7UfcI gY'g' E%

HUV'Y' !% Dck Yf' 7cfX'K]f]b['HUV'Y E%+

:][i fY' !* 'CI m[Yb': i fbUW'GWi VVYf E%

:][i fY' !+ <YUh]b['9Ya Ybh'=bghU'Uh]cb E&\$

:][i fY' !, 'DUW]b['hY': i fbUW'Hi VY E&&

:][i fY' !- 'GYUh]b['hY': i fbUW'Hi VY E&&

:][i fY' !%\$ '7C_& 'F '7Y''A Ub]Zc'X'UbX'@]bYg E&'

:][i fY' !%% '7C_& 'F '7Y'''*&&!\$\$%&%\$& 'bghU'YX E&(

:][i fY' !%& 'A Ub]Zc'X'6'cW E&(

:][i fY' !% '@]bY'Zca 'A Ub]Zc'X'6'cW'hc'7C_& 'F '7Y''A Ub]Zc'X E&)

:][i fY' !%('8]j YfhYf'J Uj Y'5ggYa V'm E&)

:][i fY' !% '@]bY'hc'G]XY'Dcfh'cZ8]j YfhYf'J Uj Y'5ggYa V'm E*&

:][i fY' !%* '7UUh'ngh<YUhYf'; Ug'7cbbYW]cb E&*

:][i fY' !%+ '8]j YfhYf'J Uj Y'; Ug'7cbbYW]cbg E&+

:][i fY' !% 'fci bX'GhfUd E&+

:][i fY' !% '7UUh'ngh<YUhYf'; Ug'7cbbYW]cb E' \$

:][i fY' !&\$ 'CI m[Yb'5XX!Cb'=bhyfZUW' E' %

:][i fY' !&% '@UbW'FYa cj U E' %

:][i fY' !&& '=bghU'@UX'<YUX'=bhyfZUW'6'cW E' &

:][i fY' !& '8]j YfhYf'J Uj Y E' &

:][i fY' !& ('CI m[Yb'7UUh'ngh<YUhYf'Hi VY'DUW]b[..... E')

:][i fY' !& '7cbhfc'g'UbX'=bX]Wjhcfg E' *

:][i fY' !*& 'GUa d'Y'DfYdUfUh]cb!A]WcWjdgi 'Y E' -

:][i fY' !& 'i fbUW'7cbhfc'7Ufx E()

:][i fY' !& 'H]a Yf'J Uj Y'5X'1 gha Ybh E(*)

:][i fY' !& 'H]a Yf'J Uj Y'5ggYa V'm E(+

:][i fY' !' \$ 'A Ub]Zc`X`5ggYa V`m'-----' E(,
:][i fY' !' % 'DbYi a Uh]W@jbY`5ggYa V`m'-----' E(-
:][i fY' !' & : i fbUW`5ggYa V`mG\YYh`cZ- -----' E) \$
:][i fY' !' !' : i fbUW`5ggYa V`mG\YYh&cZ- -----' E) %
:][i fY' !' (: i fbUW`5ggYa V`mG\YYh`cZ- -----' E) &
:][i fY' !') : i fbUW`5ggYa V`mG\YYh(cZ- -----' E) '
:][i fY' !' * : i fbUW`5ggYa V`mG\YYh`cZ- -----' E) (
:][i fY' !' + : i fbUW`5ggYa V`mG\YYh*cZ- -----' E))
:][i fY' !' , : i fbUW`5ggYa V`mG\YYh+`cZ- -----' E) *
:][i fY' !' - : i fbUW`5ggYa V`mG\YYh`cZ- -----' E) +
:][i fY' !' (\$: i fbUW`5ggYa V`mG\YYh-`cZ- -----' E) ,
:][i fY' !' (% '@cUX]b[<YUX`5ggYa V`m'-----' E) -
:][i fY' !' (& : fcjh'DUbY`7ca d`YhY`5ggYa V`m'-----' E* \$
:][i fY' !(' 'Cl m[Yb : i fbUW`9I d`cXYXJ]Yk -----' E* %
:][i fY' !((' F][\h`G]XY`J]Yk 'E'8]j]XYf'DUbY`FYa cj YX -----' E* &
:][i fY' !(() 'F][\h`G]XY`J]Yk -----' E* '
:][i fY' !((* '@Yh`G]XY`J]Yk -----' E* (

Installing the Balance

5 GUf hcf]ji g^ Ub U'mh]WU' VU' UbWV']g Uj U] UV' Y' Ug' Ub' cdh]cb" H Y' Zc' ck]b[dfcWXi fYg' g\ci 'X' VY' dYfZcfa YX' hc']bghU' U' ! cf' (! d'UVW' VU' UbWV' : cf' Z fhl Yf']bZcfa Uh]cbz fYZf' hc' h Y' a Ubi U' gi dd']YX' k]h' h Y' VU' UbWV' ...

NOTE → H Y']bghfi a Ybh'k]` cb' migi ddcfh Sartorius' Ub U'mh]WU' VU' UbWVg' C H Yf' VU' UbWVg' a Um' VY' i gYX' \ck Yj Yf'@97C']g' bch' fYgdcbg]V Y' Zc' h Y]f']bghU' Uh]cb' cf' dfcdYf' cdYfUh]cb'

5 ZH Yf' h Y' VU' UbWV']g' gYh' Xc' bch' WUb[Y' UbmicZ h Y' WcbZ] [i fUh]cb' dUfUa YhYfg' H Y' WcbZ] [i fUh]cb' dUfUa YhYfg' WUb' VY' WUb[YX' hc' Wghca' WcbZ] [i fY' h Y' VU' UbWV' Vi hcb'm' UZhYf' h Y']bghU' Uh]cb' dfcWXi fY']g' W'a d'YhYX' UbX' h Y' VU' UbWV']g' dfcdYf' mcdYfUh]b[k]h' h Y']bghfi a Ybh'

NOTE → Hc' fYghcfY' h Y' VU' UbWV' hc' ZUWcfmXYZUi' hg' fYZYf' hc' F YgYh]b[h Y' 6U' UbWV' dU[Y' E%\$'

%" GYhi d' h Y' VU' UbWV']b' h Y' cWWh]cb' k' \YfY']h' k']` VY' i gYX' 6Y' gi fY' h Y' VU' UbWV' `cWWh]cb' WcgYb']g' cb' U' ghUV' Yz' Yj Yb' gi fZUW' h Uh]g' bch' YI dcgYX' hc' j']VfUh]cbg' FYZYf' hc' h Y' a Ubi U' gi dd']YX' k]h' h Y' VU' UbWV' Zc' a cfY']bZcfa Uh]cb' FYZYf' hc' DfYdUf]b[h Y' 6U' UbWV' dU[Y' E\$'

&" : c' ck' h Y' dfcWXi fY']b' GYh]b[h Y' 8UhU' 7\ UfUVWYfg' DUfUa YhYfg' dU[Y' E*

' " GYhi d' W'a a i b]WWh]cb' VYh' YYb' h Y' VU' UbWV' UbX']bghfi a Ybh' gcZh'k' UfY' FYZYf' hc' GYh]b[h Y' 8UhU' 7\ UfUVWYfg' DUfUa YhYfg' dU[Y' E*

(" HYgh' h Y' VU' UbWV' hc' Ybgi fY' dfcdYf' cdYfUh]cb' FYZYf' hc' HYgh]b[h Y' 6U' UbWV' dU[Y' E%\$'

) " 7ca d' YhY' h Y' K' UffUbhmiF Y[]ghfUh]cb' 7UfX' h UhW'a Y' k']h' h Y' 6U' UbWV' UbX' fYh' fb' jh' hc' h Y' 6U' UbWV' a Ubi ZUWcfmXYZUi' fYf'

Preparing the Balance

%" I bdUW' h Y' VU' UbWV' UbX' UggYa VY' Jh' Ug' g\ck b']b' h Y' a Ubi U' gi dd']YX' k]h' h Y' VU' UbWV'

&" D'i [h Y' 57' UXUdhYf' gi dd']YX' k]h' h Y' VU' UbWV']bhc' ZUWcfmXYZUi' fYf'

' " 7ccbYVW' h Y' 57' UXUdhYf' WUVY' hc' h Y' dck Yf']bdi h' UW' cb' h Y' fYUf' cZh Y' VU' UbWV'

(" @Y' h Y' VU' UbWV' VmZc' ck]b[h Y']bghfi Wcb' a Ubi U' gi dd']YX' k]h' h Y' VU' UbWV'

Setting the Data Characters Parameters

GYh' h Y' XUHJ' WfUWYf' UWt fX]b['hc' h Y']bghfi W]cbg]b' h Y' a Ubi ZUWf' fYf]a Ubi U' gi dd']YX' k]h' h Y' VU' UbW'"

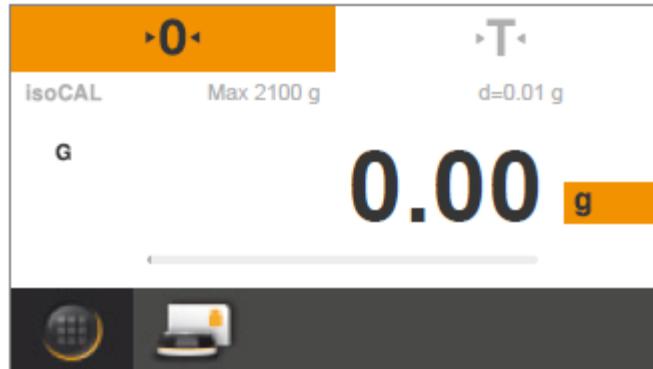


Figure 3-1
Balance Control Panel

Setting Up Communication with Balance

GYh' Zc' cck]b['gYVW]cb' YI d'U]bg' \ck 'hc' gYh'i d'Wta a i b]W]h]cb' VYh' YYb' h Y' Wta di hYf' UbX' h Y' YI hYfbU' VU' UbW'"

5 'Xf]j Yf']g' fYei]fYX' hc' WbbYVW' h Y' VU' UbW' hc' U' G6' dcfh]cb' h Y' Wta di hYf' H Y' Xf]j Yf' WYUhYg' U']fH' U' 7CA' cb' h Y' Wta di hYf' k]W' Ya i' UhYg' U' gYf]U']bhYfZUW' f7CA' dcfh' H Y' I' G6' 8f]j Yf']g' ghcfYX' cb' h Y' VU' UbW' UbX' W]b' VY' Xck b' cUXYX' VmWbbYVW]b' h Y' VU' UbW' hc' h Y' Wta di hYf' k]h' U' G6' A]b]! 6' hc' I' G6' HmdY! 5' W]VY'"

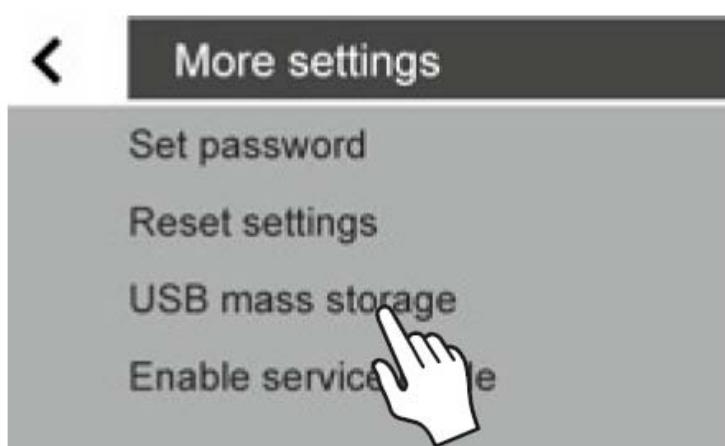
NOTE → =Zi g]b['A]Wcgczh' K]bXck g' LDz' GYfj]W' DUW' cf' UVcj Y']g' fYei]fYX' Zcf' h Y' Xf]j Yf' hc']bghU'"

Installing the USB Driver:

%" 7ccbYVW' h Y' VU' UbW' hc' h Y' D7' i' g]b['h Y' gi dd']YX' I' G6' W]VY'"

&" Hc' UWYgg' h Y' VU' UbW' gmghYa g' gYh]b[g' gY' YW' fGYh' dL' Zca' h Y' VU' UbW' a Ybi' cb' h Y' VU' UbW' Wbhf' dUbY'"

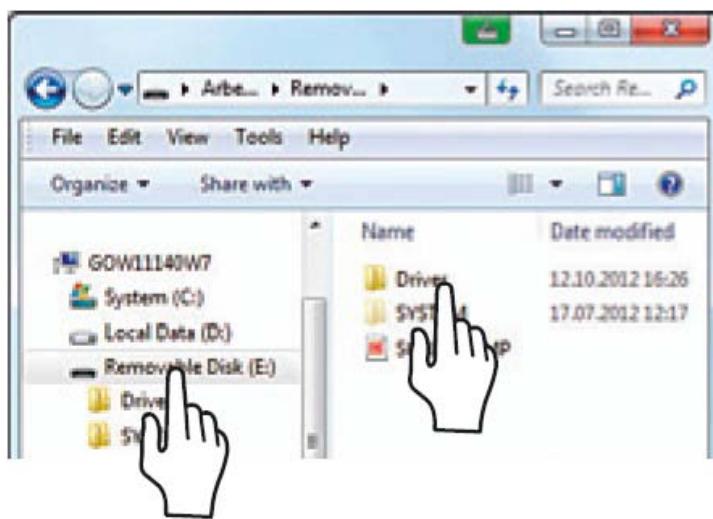
' " Hc' UWYgg' h Y' I' G6' a' Ugg' ghcfU' Y' a' Ybi' cdh]cb' cb' h Y' VU' UbW' z' [c' hc' A cfY' GYh]b[g' UbX' gY' YW' I' G6' A Ugg' GhcfU' Y'"



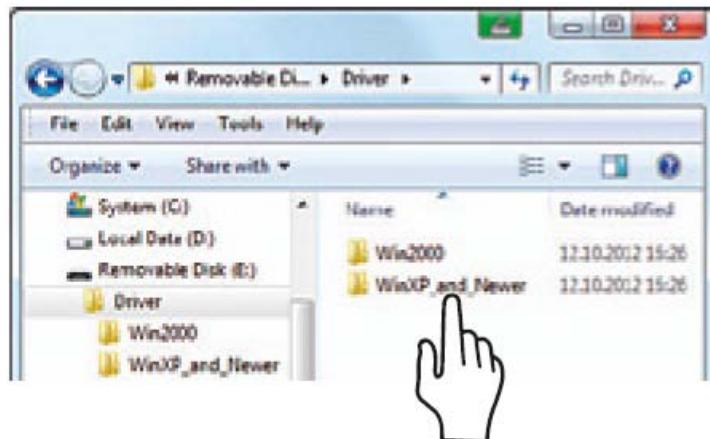
(" Hc 'WtbbYW\h\Y'VU'UbW'a Ya cfmhc'h\Y'D7žgY'Y\7cbbYW"



) " Hc]bghU`h\Y]bghU`Uh]cb'dfc[fUa 'Zcf'h\Y'I G6'Xf]j Yf'cb'h\Y'D7žgY'Y\h\Y' Uddfcd]UhY'fYa cj UV'Y'XUH\Wff]Yf'f]b'h\Jg'WlgYž'h\Y'9. 'Xf]j YL'UbX'h\Yb'gY'Y\h\Y'8f]j Yf'Zc'XYf"



* " GY'Y\h\Y'Uddfcd]UhY'Windows]Yfg]cb'Zcf'mci f'D7'UbX'gY'Y\h\Y'Zc'XYf"

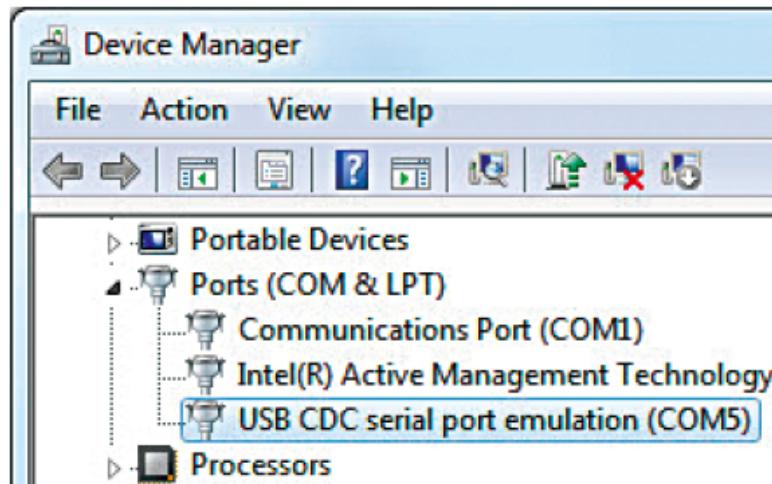


+ " GY'Y\h\Y'Z]Y'W'YX'=bghU`8f]j Yf"YI Y'UbX'Zc'ck'h\Y'cbgWYYb']bghfi W]cbg"

" CbWY'hY'Xfjj Yf']g']bgHU'YXz'8]fYWM'XUHU'hfUbgyf'hc'D7']g' Uj U]'UV'Y'Zcf'Vch' VU'UbWY'cdYfUhjb['a cXYg'fD7!G6='UbX'D7!I 6D-'GY'YWM'8]gWbbYWihc'fYh' fb'hc' hY'a Ujb'VU'UbWY'a Ybi "



- " H\Y'I G6'787'GYf]U'Dcfh'WbbYWcb'UddYUfg']b' hY'8Yj]W'A UbU[Yf'cZhY'D7' i bXYf'7cbbYWcbg" ..



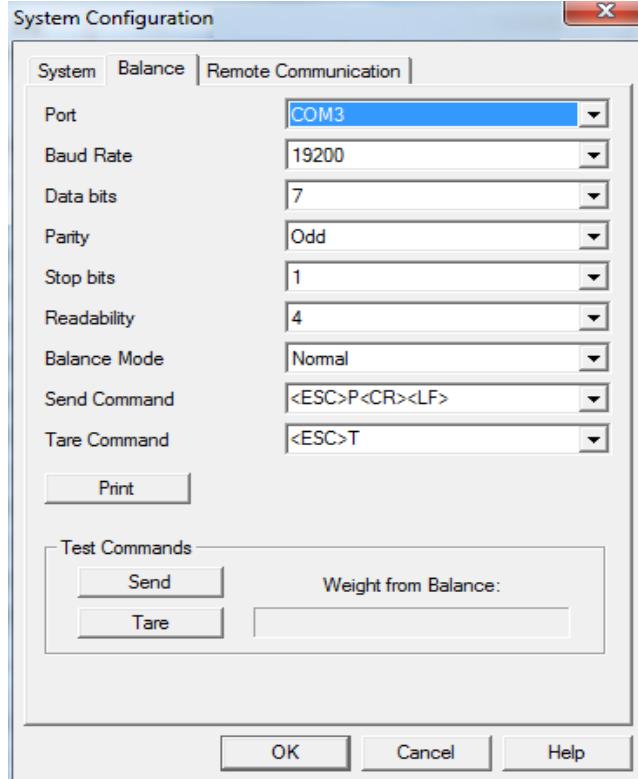
%" =Z'hY'gcZk UfY'XcYg'bchfYWb[b]nY'hY'VU'UbW'i dcb']bgHU'Uhjb'cZhY'Xfjj Yf' UbX'Wccg]b['hY'WffYWM'7CA'dcfh'WUb[Y'hc'U'X]ZZYfYbh'7CA'dcfh'hi fb'CZZhY' @97C'gcZk UfY'fYghUfh'hY'@97C'gcZk UfY'UbX'WccgY'hY'bYk'7CA'dcfh'" ..

Software Configuration

GY`YVWhhY`Wta a i b]Wjhcb`dcfh]b`h Y`@97C`gcZhk UfY`h Uhk Ug`gdYVWZYX`]b`ghYd` - `cZ
GYHjh]b['l d`7ca a i b]Wjhcb`k]h`6UUbW"

NOTE → H\Y`Zc``ck]b['gWYYb`g\ch`]'i ghfUh]cb`]g`Ub`YI Ua d`Y`cb`mUbX`a Umcf`a UmbchVY`
Udd`]WVY`h`gdYVWdfcWVXi fYg`"

%" ; c`hc`GmghYa`7cbZ][i fUh]cb`UbX`h`Yb`gY`YVh`h`Y`VU`UbW`hUV`"



&" : fca`h`Y`7cbZ][i fUh]cb`a Ybi žgY`YVh`GmghYa`" H\Y`GmghYa`7cbZ][i fUh]cb`k]bXck`
k`"UddYUf"

' " GY`YVh`h`Y`6UUbW`hUV`" H\Y`6UUbW`7cbZ][i fUh]cb`gWYYb`k`]"UddYUf"

(" : cf`Dcfhž`gY`YVh`h`Y`Uffck`UbX`h`Yb`gY`YVh`h`Y`dcfh`cWjhcb`Zfc`h`Y`]gh`h`Uh`
a`UhW`Yg`h`Y`dcfhg`Y`YVh`X`cb`h`Y`D7`hck`Yf`"8YZUi`h`g`7CA%"

) " : cf`6Ui`X`F`UfY`ž`gY`YVh`h`Y`Uffck`UbX`gY`YVh`h`Y`VU`X`fUhY`Zfc`h`Y`]gh`FYZYf`hc`
h`Y`Sartorius`=bghfi`Wjhcb`A`Ubi`U`"8YZUi`h`g`- * \$\$`Vdg`"

* " : cf`8UhJ`6]hgž`gY`YVh`h`Y`Uffck`UbX`gY`YVh`h`Y`bi`a`VYf`cZ`XUhU`V]hg`Zfc`h`Y`]gh`
FYZYf`hc`h`Y`Sartorius`=bghfi`Wjhcb`A`Ubi`U`"8YZUi`h`g`,"

+ " : cf`DUf]hmž`gY`YVh`h`Y`Uffck`UbX`gY`YVh`Y]h`Yf`cXX`cf`Yj`Yb`"FYZYf`hc`h`Y`Sartorius`
=bghfi`Wjhcb`A`Ubi`U`"8YZUi`h`g`CXX`"

, " : cf`Ghcd`6]hgž`gY`YVh`h`Y`Uffck`UbX`gY`YVh`Y]h`Yf`%`cf`&`Zfc`h`Y`]gh`FYZYf`hc`h`Y`
Sartorius`=bghfi`Wjhcb`A`Ubi`U`"8YZUi`h`g`%"

- " : cf`FYUXUV`]hmž`h`Y`XYZUi`h`g`("

%%" : cf`6UUbW`A`cXYž`gY`YVh`B`cfa`U`]ZU`VU`UbW`]g`Wbb`YVh`X`hc`h`Y`gmghYa`"GY`YVh`
8]gUV`YX`]ZU`VU`UbW`]g`bch`Wbb`YVh`X`hc`h`Y`gmghYa`"

%%": cf`GYbX`7ca a UbXžgYYW hä Y`Uffck `UbX hä Yb`gYYW hä Y`XYg]fYX`Wta a UbX`
 Zca hä Y`]gh` Hä Y`XYZUi hä]g`O9G72D07F20@2"
 %&": cf`HUFY`7ca a UbXžgYYW hä Y`Uffck `UbX hä Yb`gYYW hä Y`XYg]fYX`Wta a UbX`Zca
 hä Y`]gh` Hä Y`XYZUi hä]g`O9G72`H"
 %": GY`YVW Df]bh`hc`df]bh`U`WdmicZ hä Y`VU`UbWV`dUfUa YhYfgž]Z`XYg]fYX"
 %": I gY`HYgh`7ca a UbXg`k`Yb`]h`]g`b`YVWggUfm`hc`WV`YVW hä Y`cdYfUh]cb`cZ hä Y`VU`UbWV`
 GY`YVW`GYbX`hc`gYbX`U`k`Y][`h`Zfc` hä Y`VU`UbWV`K`Yb`cdYfUh]cb`U`z hä Y`VU`UbWV`
 fYUX]b[`k`]`X]gd`Um]b`hä Y`gd`YUXg`YYH`GY`YVW`HUFY`hc`gYh`hä Y`VU`UbWV`X]gd`Um`hc`
 nYfc"
 %": GYh`hä Y`VU`UbWV`hc`a Ubi U`df]bh`UbX`Í`U`i`Y`k`#c`=XYbh]Z`Yf`Í`

 UŁ : fca`hä Y`a`U]b`gcZ`k`UfY`gWYYb`cb`hä Y`VU`UbWž`gYYVW`fA`Ybi`E`UbX`hä Yb`
 gYYVW` fGYh`dŁ"
 VŁ GY`YVW Df]bh`i`h`Zfc` hä Y`GYh]b[`g`a`Ybi`UbX`hä Yb`gYYVW`A`Ubi`U`Df]bh`Zfc`
 hä Y`]gh"
 WŁ GY`YVW`A`Ubi`U`Df]bh`cfa`Uh`UbX`hä Yb`gYYVW`Í`U`i`Y`k`#c`=XYbh]Z`Yf`Í`Zfc` hä Y`
]gh"
 XŁ Hc`fYh`fb`hc`hä Y`a`U]b`a`Ybi`ž`gYYVW`hä Y`Uffck`]b`hä Y`i`ddYf`YZh`W`fbYf`"

Testing the Balance

: fca`hä Y`Gngh`ya`7cbZ`[`i`fUh]cb`a`Ybi`ž`gYYVW`Gngh`ya`ž`gYYVW`hä Y`6U`UbWV`HUVž`UbX`
 hä Yb`gYYVW`GYbX`H`Y`k`Y][`h`X]gd`Um`X`]b`hä Y`k`Y][`h`Zfc`6U`UbW`Vcl`g\ci`X`a`UHW`
 hä Y`k`Y][`h`X]gd`Um`X`cb`hä Y`VU`UbWV`"

Resetting the Balance

FYZYf`hc`hä Y`a`Ubi`ZUW`fYf`]bghf`W]cb`a`Ubi`U`gi`dd`]YX`k`]h`hä Y`VU`UbWV`7cbgi`h`
 hä Y`@97C`GYfj`]W`8YdUfha`Ybh`VYZcfY`fYgYH]b[`hä Y`VU`UbW`hc`ZUW`cfmiXYZUi`hg`"

Installing the Printer

- NOTE →** 5.'df]bhYf']g' bch'gi dd']YX' k]h' h' Y']bghfi a Ybh' =ha i gh'VY' di fVWUgYX' gYdUfUhY'm' FYZYf' hc' Cdjh]cbg' dU[Y' %E &* z' Zcf' a cfY']bZcfa Uh]cb''
- %" G\i h'Xck b'UbX' h' fb' CZZ'h' Y' Wta di h'Yf' gmghY'a ']Z'bYWggUfm'
- &" I bdUW' h' Y' df]bhYf' UbX' cWWhY' h' Y' df]bhYf']bhYfZUW' Ww' Y''
- ' " FYZYf' hc' h' Y']bghU' Uh]cb']bghfi W]cbg'gi dd']YX' k]h' h' Y' df]bhYf' UbX' WtbbYWM' h' Y' df]bhYf' hc' h' Y' Wta di h'Yf''
- (" FYZYf' hc' h' Y']bghU' Uh]cb']bghfi W]cbg'gi dd']YX' k]h' h' Y' df]bhYf' =bghU' h' Y' df]bhYf' cb' h' Y' k cf_ gi fZUW' UbX' Uh]UW' U' bYWggUfm' Ww' Yg' UbX' Wta dcbybhg''
-) " FYZYf' hc' h' Y']bghU' Uh]cb']bghfi W]cbg'gi dd']YX' k]h' h' Y' df]bhYf' UbX']bghU' h' Y' df]bhYf' gcZhk UfY' H\jg' k]`fY' h' fb]b['cb' h' Y' Wta di h'Yf' gmghY'a ' UbX' df]bhYf' =h]jg' bch' bYWggUfm' hc' h' fb' cb' h' Y']bghfi a Ybh' Uh' h']g' h' a Y''
- * " 5ZHYf' h' Y' df]bhYf']g']bghU' YX' UbX' h' Y' gh' Xz' h' fb' CZZ'h' Y' Wta di h'Yf' UbX' df]bhYf' ''

Stackable Carousels

GhJW]b[\Wfci gYg]bWfci gYhYbi a VYfcZgUa dYgkhUhWfbVYUbU'mYX'kjhci h
 cdYfUhcf]bhYfj YbhJcb"9UW\Wfci gY\Wfb\cX&- gUa dYgUbXi d'hc'Zci fWfci gYg
 WfbVYghJWYX'cb'hkY'cUX]b[\YUX"
 5g'gUa dYg'UfY'UbU'mYXz'gUa dYg'Zfc'hkY'i ddYf'Wfci gY'Xfc'UbX'Z'hkY'ckYf
 Wfci gY'"CbmigUa dYg'Zfc'hkY'ckYf'Wfci gY'Xfc']bhchY'cUX]b[\YUX"
 %" 8YhYfa]bY'hkY'bi a VYfcZWfci gYg'hkUhUfY'[c]b[hc'VY'i gYX'UbX'ghJWYX"
 &" DfYdUfY'UbX'kY][\&- gUa dYg'Zfc'hkY'Zfgh'cf'Vchhca 'Wfci gY'"
 ' " @cc_]b[Xck b]bhchY'Wfci gYzH fb'hkY'Vchhca 'd'UhY'i bh'\c'Y'bi a VYf' \$'g
 cdYb'FYZYf':][i fY'"!&Z'ck]b["

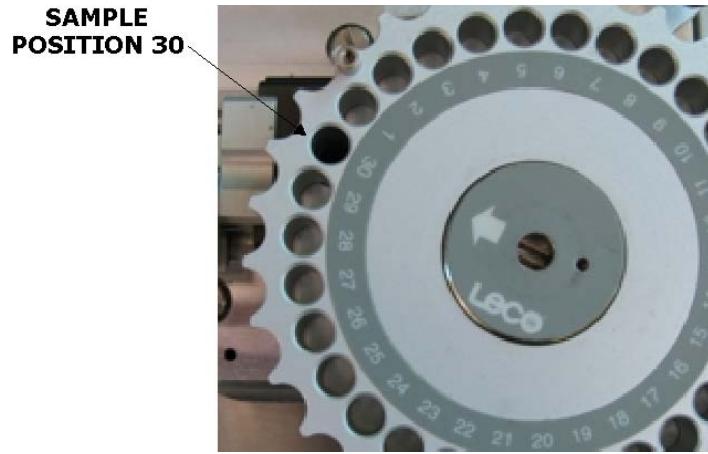


Figure 3-2
Carousel Open Position

(" -bgYfh'gUa dYg]bhch\c'Yg%hkfci [\&- cZhY'Wfci gY'"8c'bch'a cj Y'hkY'Vchhca
 d'UhY'"l gY'hk]g'Wfci gY'Zfc'hkY'Zfgh'cf'Vchhca 'Wfci gY'cb'm'
)" Kjhci ha cj]b[hkY'Vchhca 'd'UhYz]bhch'hkY'Wfci gY'cbhc'hkY'cUX]b[\YUX"
 hkY'Uf[Y'UbX'ga U'd]bg'cb'hkY'Vchhca 'd'UhY'a i gh'U][b'k]jh'hkY'c'Yg]b[hkY
 'cUX]b[\YUX'"8C'BCH'a cj Y'hkY'Vchhca 'd'UhY'hc'U][b'hkY'c'Yg'a cj Y'hkY
 YbhfY'Wfci gY'"FYZYf'hc':][i fY'"!&Z'dU[Y' E%&Z'UbX':][i fY'"!(Z'dU[Y' E%""

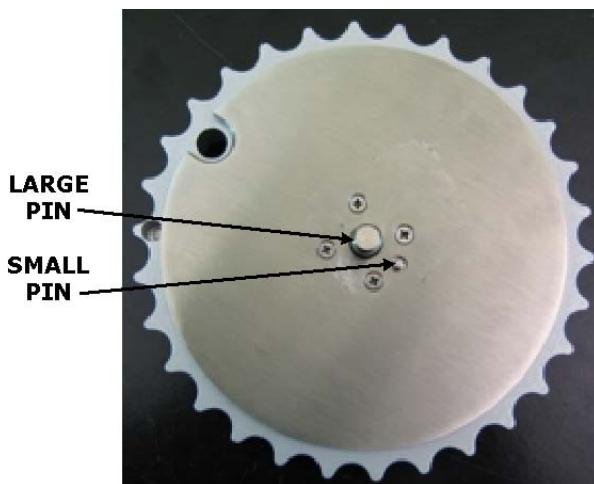


Figure 3-3
Carousel Bottom Plate

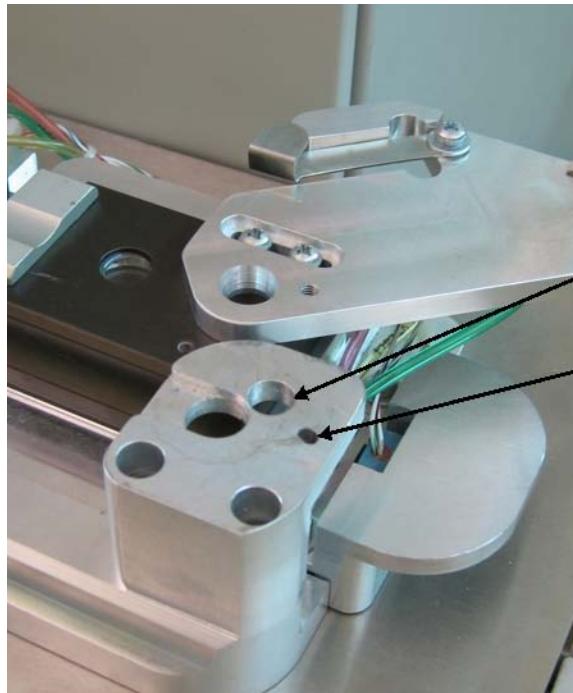


Figure 3-4
Carousel Mounting Position

* " DfYdUfY'UbX'k Y][\ i d'hc '&- 'a cfY'gUa d'Yg'Zcf'hY'gYWbX'Wfci gY'"
 +" @cc_]b['Xck b']bhC'hY'Wfci gY'zH fb'hY'Vchca 'd'UhY'i bh]' \c'Y'bi a VYf'&- 'g'
 cdYb"
 , " =bgYfh'gUa d'Yg']bhC'\c'Yg' \$'h\fcI [\ &, 'cZhY'Wfci gY'" 8c'bch'a cj Y'hY'
 Vchca 'd'UhY"
 - " K]h\ci h'a cj]b['hY'Vchca 'd'UhY'zU'][b 'hY'ghUbXcZZ'UbX']bghU' 'hY'gYWbX'
 Wfci gY'cb'hc'd'cZhY'Zfgh'Wfci gY'" H\Y'ghUbXcZZ'cb'hY'Zfgh'Wfci gY'g\ci 'X'VY'
]bgYfh'X']bhC'hY'\c'Y']b' hY'gYWbX'Wfci gY' X]fYVWmi bXYf'hY'ghUbXcZZ']b' hY'
 gYWbX'Wfci gY'" FYZf'hc' :][i fy'" !) z Zc'ck]b[""

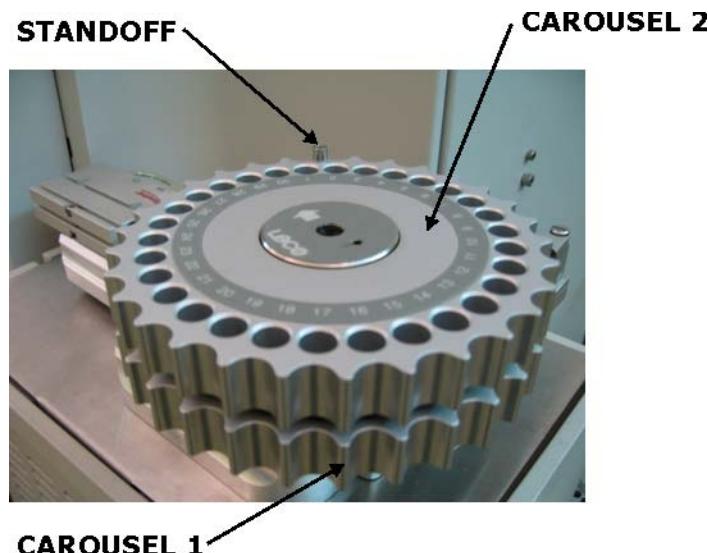


Figure 3-5
Stacked Carousels

%\$" Hc'ghUW_a cfY'Wfci gY'gž'fYdYUh'ghYdg'+Hfci [\` - "': cf'hY'h]fx'Wfci gY'`c`Y'&,
g\ci `X`VY'cdYb'UbX'Zcf'hY'Zci fh\`Wfci gY'`c`Y'&+g\ci `X`VY'cdYb'`5g'hY'
gJa d`Yg'Xfcf'`]bh\`hY'Zfgh'Wfci gY'ž'hY'mk]`VY']b'hY'WffYVWbi a Yf]W`cfXYf'"

%%" 9bhYf'hY'gJa d`Y']bZcfa Uh]cb`]bh\`hY'gdfYUXg\YYh'=h'k]`VY'bYWggUfmhc'
][bcfY'hY'gJa d`Y'dcg]h]cb`bi a VYfg'cb'hY'Wfci gY'g'UbX'bi a VYf'hY'gJa d`Yg'
]b'hY'gdfYUXg\YYh'Zfca`%h\`hY'\`][\Ygh'gJa d`Y'bi a VYf']b'WbgYW h]j Y'cfXYf'"

NOTE → =Z'cdYfUh]cb`]g`]bhYfa`]hYbh'k`]h\`hY'k`Y][\h'cZ`Zci f'`Wfci gY'gž'dYfZcfa`hY'
dfcWXi fY'ci h]bYX']b'7Ufci gY'5'][ba Yb\`dU[Y'-E'`"

TruSpec Oxygen Add-On

Equipment Packages

TruSpec Oxygen Add-On
The TruSpec Oxygen Add-On package includes the following components:
• 628 O Module Component Pack (622-090-070)
• 628 Oxygen TruSpec Dedicated Micro

628OTRSM Package consisting of: 628 Oxygen TruSpec Dedicated Micro

%** \$!\$%\$!%((..... D57? 5779GGCFM898=75H98'A=7FC#CLM 9B
%** \$!\$%\$!%) \$ D57? 'HFI GD97'898=75H98'A=7FC 588'CB CLM 9B
%* &&! \$\$! - \$\$ 5GGM*&, 'CLM 9B'AC8I @9'& '\$

628 O Module Component Pack (622-090-070) consists of:

%%-\$!+((..... G7F9K '7G?<'''&) \$!&\$L'"+) 'GH'ND
%* \$&!, '\$ C!F=B; '%& ''%" %&L '%(-- L "\$- ' G
%* \$, !\$) & 9@A 9BH<95H=B; '+") L '\$\$L &"%&
%* \$, !\$) + 5GGMD@5H9'58DHF : I FB '9LH
&* \$, !\$*) @5B79; F5D<+H
%* \$, !\$, + K 5G<9F : @H''' \$+L%"()) L"&) 79F
%* \$, !% \$ HI 69'EI =7? '8=G7'''-) C8L %
%* \$, !%) 5GGMHCC@9LHF57HCF'7CA6 HI 69
%* \$, !, -, 7CJ 9F 'F979DH57@9'GGH
%* %) !, '\$!\$(\$ HI 6=B; 'D: 5 "%&) L '\$*'=8'L'(\$
%* %) !, '\$!%\$ HI 69'D: 5 "%&) L '\$* &) '=8'%'=B
&* &% \$% J 5@J 9: @CK '7CBHFC@\$!) 'G7: A
%* &) !(\$%'*\$ HI 69'A1 @@=H9'A57<=B98
%* &) !) \$%) * 5GGM@B9'DBI 9A 5H=7
** &) !) \$!) !*(' =BGI @5H=CB '9@A 9BH<95H=B
%* \$!\$%\$!%(% 5GGM6@C7? '=B9F: 579'A=7FC'898=75H98
%+*) !-+, F97D' \$5'''%& #&) \$J ' D(K 'H@
&++' !**% : H; '58DHF '6F '''\$* <6! '%\$!' &I B;
'++-!) % C!F=B; '%) ''%" - +L '&"%& L "\$- ' J
%%- \$!&+ G7F9K 'A D< D''' , !' &L''' , 'GH'ND
%%- '!\$, \$ K 5G<9F : @H'''%+\$L''' +) L \$"' GHND

628 Oxygen TruSpec Dedicated Micro Add-On Pack (660-010-150) consists of:

%% \$! &+·	G7F9K 'A D<D' · · · , !' &L'"&) 'GH'ND'
%% ' !\$,\$, ·	K 5G<9F '@? '9L ' " "%+&L ' " , %GHND'
)* %+! (, (·	: H; 'BI H'FB8 ' "%&H'89@GI D9F : #@
)* %+! (,) ·	: H; ' : F @ 9H: 9'"%"&) H'K #F9H'F=B;
%* % !\$((·	756@9'5GGM75H') 9%"=B'F!(()
%** \$! \$%%!%(& ·	5GGM<5FB9GG'DCK 9F '57'K #A A D9F '898=75H98
&* % ! , ' \$!\$(\$ ·	HI 6=B; 'D: 5'"%"&) L'"\$* =8'L'(\$
%** \$! \$%%!%(' ; ·	5GGMD5B9@G=89'FHK #75H<95H'898=7'A =7FC'C
&* %&! , ((·	: H; '58DHF 'GG'"%"&H!) #%"!&('I B:
%%* %) ! , ' \$ ·	HI 6=B; 'D: 5'"%"C8L'"\$* &) =8L'&)
%* && \$%% %\$& ·	5GGMA5B=C@8'<&C=F'79@@C&: I FB579
%* && \$%% ((* ·	5GGM8=J 9FH9F 'J 5@ 9'7<BG'A =7FC
%+ , &!) \$& ·	: H; '58DHF 'GG'"%"&H!'%"&A DH'
%&\$! +%* ·	A 5BI 5@=BGHF 'HF1 GD97'A =7FC

628 Oxygen TruSpec Dedicated Micro Accessory Pack (660-010-144) consists of:

%(\$% \$) ' ·	G5A D@9'579H5B=@89'75F6CB '+%'"%"& ;
%(\$% %+\$ ·	7CDD9F 'CL=89'F5F9'95FH< ') \$;
%(\$& !% (·	GH8'69BNC=7'57=8'--I ' ; @%\$;
%(\$& !%> * ·	DCK 89F '75F6CB '6@? '(\$Z A 9G< '%& ;
%(\$& ! &&, ·	D58'; F5D<=H9'"&) 'L'"&)
%* \$% ((& ·	C!F=B; '%%'"") *&L'""+(, L'"\$-' J
%* \$% - *' ·	75DGI @9'H=B'"") L(L'"%AA') (A; '%%\$\$D?
%* \$*!\$*& ·	7FI 7=6@9'; F5D<=H9'"%\$#D?
** \$, !\$, - ·	C!F=B; '%%'"") *&L'""+(, L'"\$-' 5
** \$, !\$- \$ ·	C!F=B; '%%&'"", +) L'"%& L'"% +5
** %%d') % %+, ·	C!F=B; '%%'"&- L'"%" - G
%* % - !% (·	HI 69'75H5@GH<95H9F
*++&!) &\$ ·	C!F=B; '%%'"&) \$L'"(" *L'"\$-' J
%++) !' \$* ·	=@H9F 'G97CB85FM%\$A =7FCB
%++) !* \$% ·	HI 69'E1 =7? '8=G7'"") - \$8'"* \$\$DM
%(\$&! *) * ·	7CDD9F 'HI FB=B; G'89; 5GG98 '*\$;

Initial Installation

6YZcfY]bghU`]b['h Y'* & 'C A cXi 'Yz'dYfZcfa 'h Y'dfcWVXi fYg]b 5dd'm]b['Dck Yf' dU[Y' &E% z UbX GmghYa 'GYh d' dU[Y' (E%'

H Y Wi WY'Y UbX UbWV a i gh VY'fYa cj YX'Zca 'h Y'df]a Ufmg]XY'cZh Y'Wta Vi gh]cb' h VYz]b 'h Y'XYhYfa]bUhcfz'VYzcfY'dYfZcfa]b['cl m[Yb'UbUmYg''

GdYVWVWVh]cbg'Zcf' h Y'* & 'C A cXi 'Y'UfY'']ghYX']b[GdYVWVWVh]cbg' dU[Y' %E' \$''

%" Dfcj]XY'U'k cf_`gi fZWV'k]h 'Wbj Yb]Ybh Y'YVW]W' dck Yf'gi dd'm'

&" D'UVW'h Y'Z fbUWV'*]bVWYg'hc' h Y'f][\h g]XY'cZh Y'XYhYfa]bUhcf''

' " 5'a UY'd'i ['UbX'ZYa UY'fYWdHUVWz'k \]WV'Wb'VY'i gYX'Zcf' h Y'dck Yf'WfX'cZh Y' Z fbUWVz'UfY'gi dd'JYX' Zch Yf'hmDg'cZWbbY'cfg'UfY'i gYXz'Zc'ck' h Y'k]fY' Wt'cf'Wt'XY'g'ck b]b[HUVY' !%Z'Zc'ck]b["8c'bch'd'i ['h Y'Z fbUWV]b[i bh]']bghfi WMYX'hc'Xc'gc''



Hc'Uj c]X'Y'YVWf]W' g\cWz'Xc'bch'd'i ['h Y'Z fbUWV]bhc'ZUVW]hmidck Yf'i bh]']bghfi WMYX'hc'Xc'gc''

Power Cord	Connection
6'UW'	& '\$'J r'
K \jhY'	BYi hfU'
; fYYb''	; fci bX'fYUfH'&

Table 3-1
Power Cord Wiring Table

Oxygen Furnace Scrubber

%" G]XY 'h Y 'h VY 'hck UfX 'h Y 'ei]W 'X]gWbbYWVcW 'k]h 'h Y 'hJdYfYX 'dcfh 'h]hci h
h Y 'ZYYX 'h VY 'YbXz 'h Yb 'di 'h Y 'h VY 'cZZ 'h Y 'hJdYfYX 'dcfh 'FYZYf 'hc :][i fY '' !&) ž
dU[Y ' E' *".

&" DUW_ '#]bW 'f% 'a a E'cZ['Ugg 'k cc ']bhc 'h Y 'gWYYb 'Z]hYfYX 'Vchca 'cZ 'h Y 'h VY ''
FYZYf 'hc DUW]b['h Y 'FYU[Ybh 'h Y 'VY ž dU[Y '&E %\$".

' " :]' 'h Y 'Vchca '\UZcZ 'h Y 'h VY 'k]h '5b\mKfcby " 'FYZYf 'hc :][i fY '' !* ž Zc 'ck]b[""
:]' 'h Y 'hcd '\UZcZ 'h Y 'h VY 'k]h '@7CGCF6 ".

(" DUW_ '%#]bW 'hc '#]bW 'f% 'hc '% 'a a E'cZ['Ugg 'k cc ']bhc 'h Y 'hcd 'cZ 'h Y 'h VY ''

) " FY]bghU ''h Y 'h VY]b 'h Y 'V 'cW g"

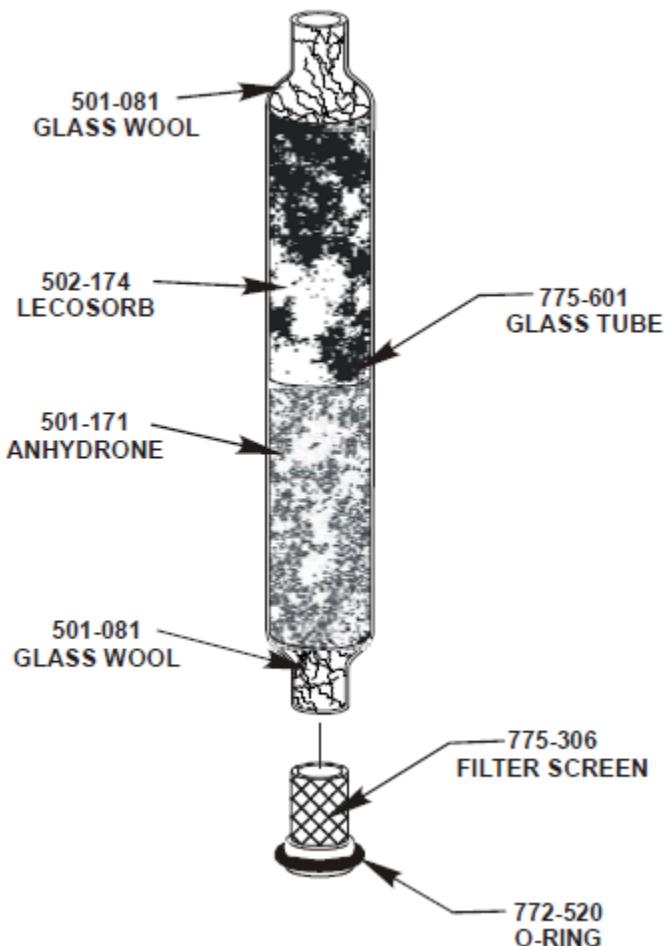


Figure 3-6
Oxygen Furnace Scrubber

Installing the Heating Element

%" FYa cj Y'hk Y'Zci f'gWYk g'UbX'hU_Y'cZZhY'gUa d'Y'Xfcd'd'UhY''FYZYf'hc':][i fY'!+ždU[Y' E&\$".

&" FYa cj Y'hk Y'Zci f'gWYk g'UbX'hU_Y'cZZhY'hc'd'd'UhY".

' " FYa cj Y'hk Y'Zci f'gWYk g'UbX'hU_Y'cZZhY'\YUhg\]Y'X".

(" FYa cj Y'hk Y'Z fbUW'f][\h]g]XY'dUbY".

) "@"cgYb'hk Y'hc i a VgWYk g'UbX'hU_Y'cZZhY'ZUb'd'UhY'UggYa V'm' hY'k]fYg'Xc'bch'\Uj Y'hc'VY X]gWbbYWWYX".

* "@"Zh'hk Y'hc c'YUh]b['YYa Ybh'YUXg'Uk UmZca'hk Y'\YUh]b['YYa Ybh'UbX']bgYfh'hk Y'\YUh]b['YYa Ybh'Ug'g\ck b']b:[i fY'!+ždU[Y' E&\$".

+ " FYa cj Y'hk Y'hc c'gWYk g'UbX'k Ug\Yfg'hk Uh'UhUW'hk Y'dck Yf'gi dd'm'YUXg'hc'hk Y'hYfa]bU'V'cW".

, " @"bY'i d'U'\YUh]b['YYa Ybh'YUX'YbX'cj Yf'U'hYfa]bU'UbX'hk Yb'd'UW'U'dck Yf'gi dd'm'YUX'YbX'cj Yf'k Y'\YUh]b['YYa Ybh'YUX'YbX".

- " GYWfY'hk Y'hc c'YUXg'i g]b['cbY'cZhY'gWYk g'UbX'k Ug\Yfg'fYa cj YX']b'U'dfYj]ci g'ghYd".

%" =bgYfh'hk c'\YUh]b['YYa Ybh'ghf]dg'UfcibX'hk Y'hc'd'cZhY'\YUh]b['YYa Ybh'Ug'g\ck b']b:[i fY'!+ždU[Y' E&\$".

%%" FYUhUW'hk Y'ZUb'd'UhY'UggYa V'm'.

%&" FY]bgHJ'`hk Y'\YUhg\]Y'Xz'hc'd'd'UhYz'UbX'gUa d'Y'Xfcd'd'UhY".

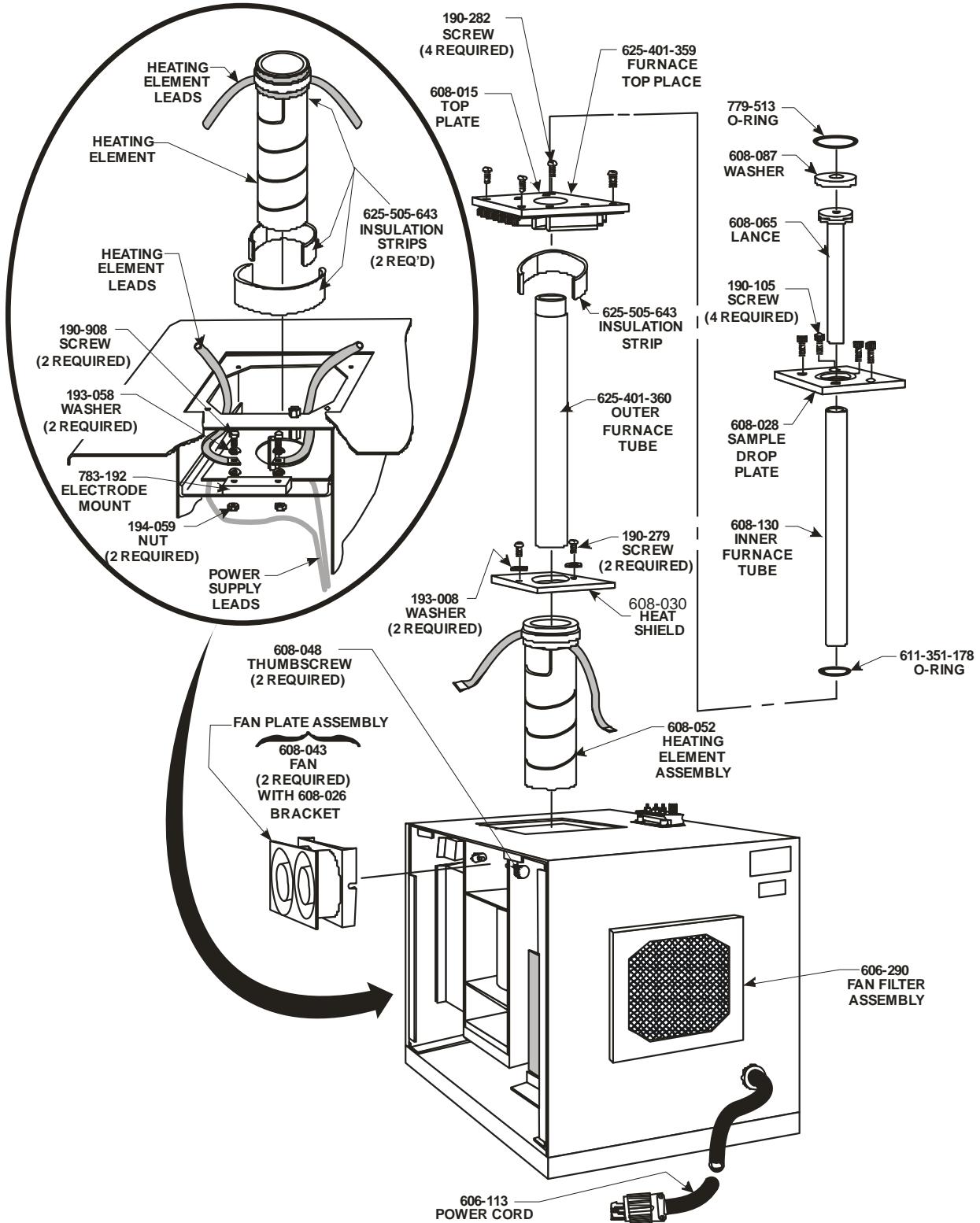


Figure 3-7
Heating Element Installation

Packing and Installing the Furnace Tubes



ELECTRICAL SHOCK HAZARD

To prevent an electrical shock, turn Off the determinator and unplug it from facility power before removing the side panel.

- %" Hi fb 'CZZ'h\Y'XYhYfa]bUhcf'UbX'i bd'i ['hZfc a 'Y'YVWf]W' dck Yf"
- &" F Ya cj Y'h\Y'f][\h[g]XY'dUbY'cZh\Y'* &, 'C'A cXi 'Y"
- ' " F Ya cj Y'h\Y'gUa d'Y'Xfc d'UhY'UbX'hcd'd'UhY"
- (" J Yfm'[\h'm'i Vf]WUhY'h\Y'Vchca [bg]XY'cZh\Y'ci hYf'Z fbUW'h VY'k]h'*%*!) & J UWia'; fYUgY"
-) " =bgYfh'h\Y'ci hYf'Z fbUW'h VY']bhc'h\Y'\YUhj['YYa Ybh'h\Y'ci hYf'Z fbUW'h VY' k]`a YYh'fYg]ghUbW'Ug]h]g'di g\YX'dUgh'h\Y'c!f]b['gYU'''6YzcfY'h\Y'h VY'g]b' d'UW'k fUd]bgi 'Uh]cb'Ufc bX'h\Y'h VY'bYUf'h\Y'hcd''FYZYf'hc':][i fY'' !- z'dU[Y' 'E&" 7cbhjbi Y'hc'di g\h\Y'ci hYf'Z fbUW'h VY'i bh]h]g'Zfa 'migYUhYX"
- * " =bghU''h\Y'hcd'd'UhY'cZh\Y'Z fbUW"
- + " F Ya cj Y'h\Y'Zci f'gWYk g'UbX'fYa cj Y'h\Y'GUa d'Y'8fc d'UhY"
- , " D'UW'h\Y'*\$%') %&%+, 'C!f]b['Ufc bX'h\Y'ci hYf'Z fbUW'h VY"
- " F Y]bghU''h\Y'gUa d'Y'Xfc d'UhY"
- %\$" Fc''h\Y'[fUd\]hY'dUX'UbX']bgYfh]h]bhc'cbY'YbX'cZh\Y']bbYf'Z fbUW'h VY'i bh]h\YfY'g'U'%'!bW'fYVgg'VYhK YYb'h\Y'[fUd\]hY'dUX'UbX'h\Y'YbX'cZh\Y']bbYf'Z fbUW'h VY''FYZYf'hc':][i fY'' !- z'dU[Y' 'E&"
- %%" J Yfm'[\h'm'i Vf]WUhY'h\Y'Vchca [bg]XY'cZh\Y']bbYf'Z fbUW'h VY'k]h'*%*!) & J UWia'; fYUgY"
- %&" =bgYfh'h\Y']bbYf'Z fbUW'h VYz[fUd\]hY'dUX'YbX'Xck bZ]bhc'h\Y'ci hYf'Z fbUW'h VY''h\Y']bbYf'Z fbUW'h VY'k]`a YYh'fYg]ghUbW'Ug]h]g'di g\YX'dUgh'h\Y'c!f]b['gYU'''7cbhjbi Y'hc'di g\h\Y']bbYf'Z fbUW'h VY'i bh]h]g'Zfa 'migYUhYX"
- % " Dci f'&&) [fUa g'cZWfVcb'V'UW'_dck XYf']bhc'h\Y']bbYf'Z fbUW'h VY'i g]b['h\Y' Z bbY"
- % " =bgYfh'h\Y'Wi W'Y'YI hfUWfc'hcc']bhc'U'*\$*!\$*&' ; fUd\]hY'7fi W'Y'UbX'ck Yf']h]bhc'h\Y'Z fbUW'i bh]h]g'Yg]b['cb'h\Y'WfVcb'V'UW'_dck XYf'"
- % " F Y'YUgY'h\Y'Wi W'Y'UbX'fYa cj Y'h\Y'Wi W'Y'YI hfUWfc'hcc'"
- %* " @ck Yf'h\Y'[fUd\]hY'UbW'WfYZ'`m]bhc'd'UW"
- %+ " =bghU''h\Y'*\$, !\$, +'K Ug\Yf'cb'h\Y'UbW'UggYa V'mi
- % " F Y]bghU''h\Y'gUa d'Y'Xfc d'UhY'UbX']bgYfh'h\Y'++-!) % 'C!f]b['bhc'h\Y'[fccj Y' cb'h\Y'gUa d'Y'Xfc d'UhY"
- %- " D'UW'h\Y']bgi 'Uhcf'WfWY'cb'hcd'cZh\Y'ci hYf'Z fbUW'h VY"
- &\$" F Y]bghU''h\Y'YZh'g]XY'dUbY'UbX'd'i ['h\Y'XYhYfa]bUhcf'VUW'_bhc'Y'YVWf]W' dck Yf'"

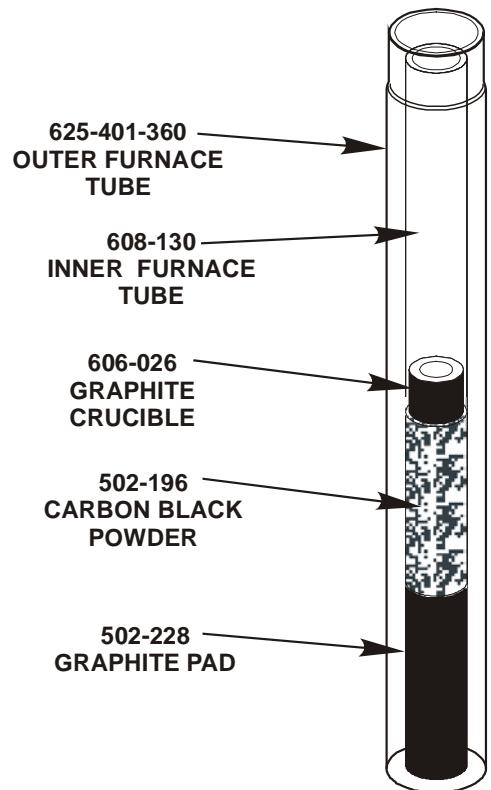


Figure 3-8
Packing the Furnace Tube

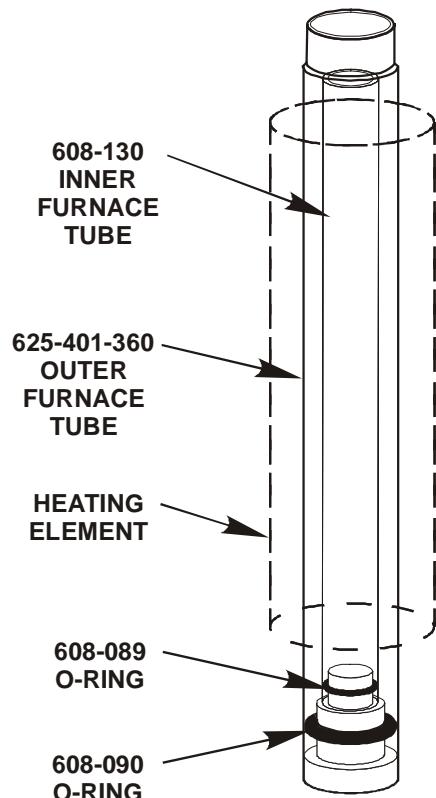


Figure 3-9
Seating the Furnace Tube

Installing the Diverter Valve and Side Panel

Installing the Diverter Valve:



ELECTRICAL SHOCK HAZARD

To prevent an electrical shock, turn Off the determinator and unplug it from facility power before removing the side panel.

- %" Hi fb 'CZZh\Y'XYhYfa]bUhcf'UbX'i bd'i ['hZfc a 'Y'YVW]W'dck Yf"
- &" F Ya cj Y'h\Y'f][\h'g]XY'dUbY'cZ'h\Y']bghfi a Ybh'H\g'dUbY'k]`bc`cb[Yf'VY' i gYX'6Y'gi fY'h\gYh'Ug]XY'h\Y'\UfXk UfY'gYVWf]b['h\Y'dUbY'h\Y']bghfi a Ybh'H\Y'\UfXk UfY'k]`VV'i gYX'UhYf'h\UhUW'h\Y'bYk 'g]XY'dUbY'"
- ' " 8]gWbbYVW'h\Y'h\k c`]bYg'WbbYVWYX'h\Y'7C_&F'W``a Ub]Zc'X''FYZf'h\c' :][i fY" !%\$"

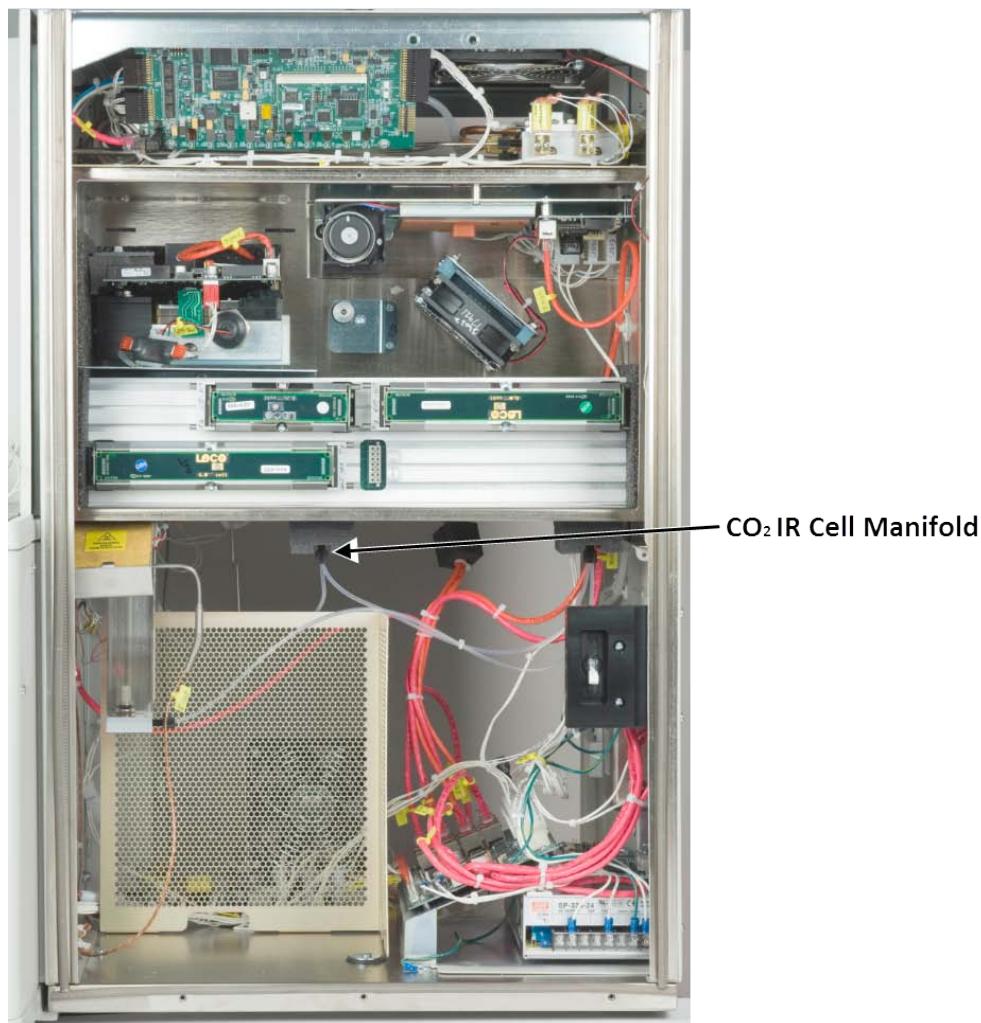


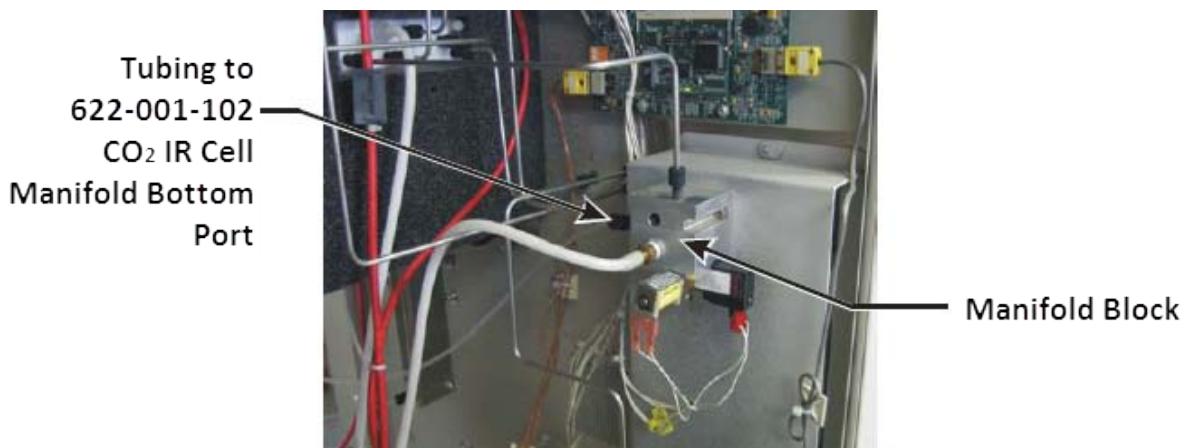
Figure 3-10
CO₂ IR Cell Manifold and Lines

(" F Ya cj Y'UbX'X]gWfX'hY'cf][]bU'7C&=F'W``a Ub]Zc'X'UbX]bghU'hY'bYk'*&!\$%\$&'7C&=F'7Y``A Ub]Zc'X'i g]b['hY\UfXk UfY'fYa cj YX'Zca 'hY'cf][]bU']bghU'Uh]cb"FYZYf'hc:[i fY'!%"



**Figure 3-11
CO₂ IR Cell 622-001-102 Installed**

) " 7ccbYW'hY[Ug`]bY'Zca 'hY'a Ub]Zc'X'V'cW'hUh'k Ug'X]gWbbYW'MX'Zca 'hY' cf][]bU'7C&=F'W``a Ub]Zc'X'h'c'hY'Vchca 'dcfhcZ'hY'bYk'7C&=F'W``a Ub]Zc'X' h'g'k]'`fYe[]fY'hY'WbbYWfcf'cb'hY'YbX'cZ'hY'[Ug`]bY'Zca 'hY'a Ub]Zc'X' V'cW'hc'VY'fYa cj YX'UbX'fYd'UWX'k]h'U'*%+!(, ('Bi h'*%+!(,)': Yffi 'Y':]h]b['UbX'hY'+, &) \$&'5XUdHfYf:]h]b["FYZYf'hc:[i fY'!%&'UbX' :]i fY'!%"



**Figure 3-12
Manifold Block**



Figure 3-13
Line from Manifold Block to CO₂ IR Cell Manifold

* " =bghU``h\ Y`bYk `* && ! \$\$% ((* '8]j Yf\Yf`J U]j Y`5ggYa V'mhc`h\ Y`VUgY`cZ\h\ Y`i b]h
i g]b['U% \$! &+, 'GWYk `UbX`U%-' !\$)) 'K Ug\Yf"FYZYf`hc :][i fY" !%("

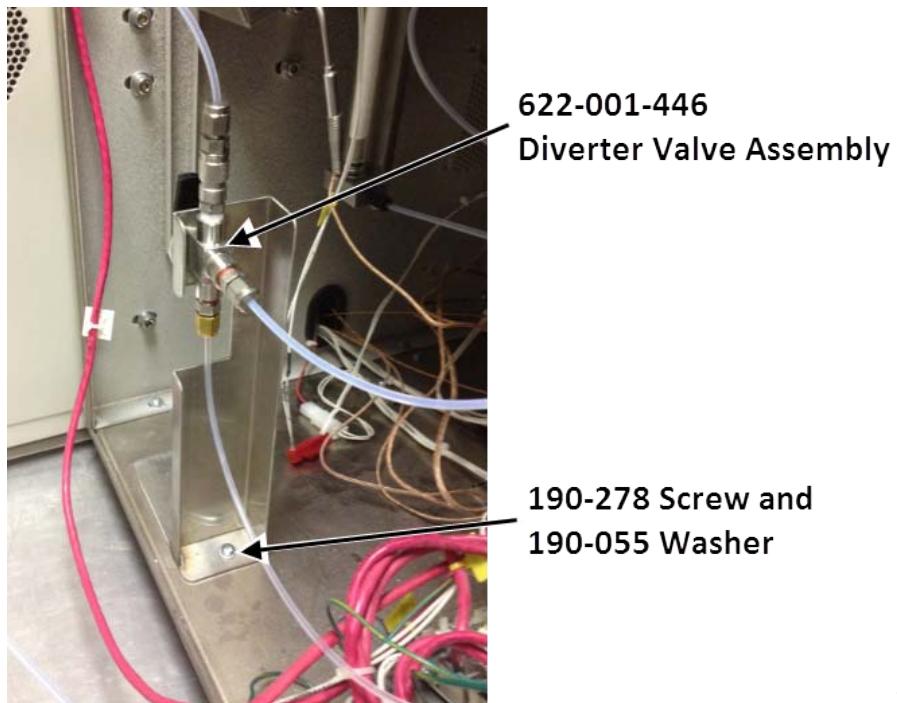
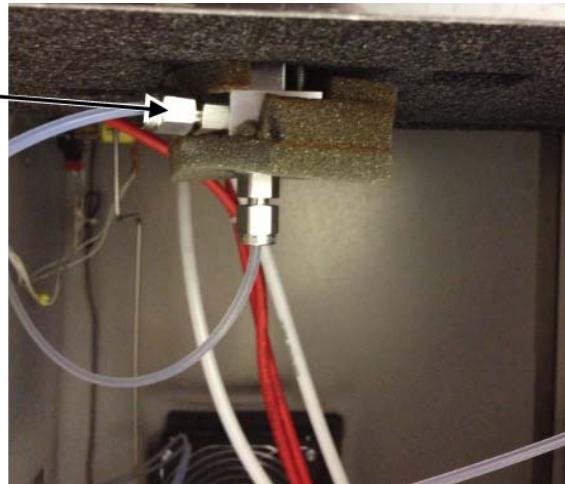


Figure 3-14
Diverter Valve Assembly

+ " 7cbbYWlhl Y'chYf[Ug'']bY'hUhkUg'X]gWtbbYWlYX'Zfc a 'hY'cf][]bU'7C& 'F'W''
 a Ub]Zc'X'VYh YYb'hl Y'g]XY'dcfhcZhly'bYk'* &&! \$\$% \$& 'F'7Y''A Ub]Zc'X'UbX'
 hY'g]XY'dcfhcZhly'* &&! \$\$% ((*'8]j YfhYf'J U'j Y'5ggYa V'm'FYZYf'hc':][i fY'' !%)
 UbX':][i fY'' !%+''

**Gas Line from
Side Port of
Diverter Valve
Assembly**



**Figure 3-15
Line to Side Port of Diverter Valve Assembly**

, " 8]gWtbbYWlhl Y'[Ug'']bY'Zfc a 'hY'Vchca 'cZhly'gi'Z f'W''UbX'fYWtbbYWl]h'hc'hl Y'
 Vchca 'dcfhcZhly'* &&! \$\$% ((*'8]j YfhYf'J U'j Y'5ggYa V'm]Zfi bb]b['hY'
]bghfi a Ybh]b['7<BG'a cXY'Zhly]bghfi a Ybh]g'U'7<B'Z'WtbbYWlhl Y'h V]b['Zfc a
 hY'Anhydrene'h VY'hc'hl Y'Vchca 'dcfhcZhly'* &&! \$\$% ((*'8]j YfhYf'J U'j Y'
 5ggYa V'm'FYZYf'hc':][i fY'' !%+''
 - " 7i h'UbX'WtbbYWlU'gYWlcb'cZhly'*%!, ' \$'hi V]b['VYhk YYb'hl Y'hcd'dcfhcZhly'
 * &&! \$\$% ((*'8]j YfhYf'J U'j Y'5ggYa V'm'UbX'hl Y'WlhU'mgh\YUhYf'cb'hl Y'bYk'f][\h
 g]XY'dUbY'Vmi g]b['hk c'*%&, (('5XUdhYf':]h]b[g'k]h'hk c'*%+! (, ('Bi hg'UbX'
 hk c'*%+! (,) : Yffii 'Y':]h]b[g'FYZYf'hc':][i fY'' !%* 'UbX':][i fY'' !%+''

**Gas Line from Top Port of
Diverter Valve Assemby**



**Figure 3-16
Catalyst Heater Gas Connection**

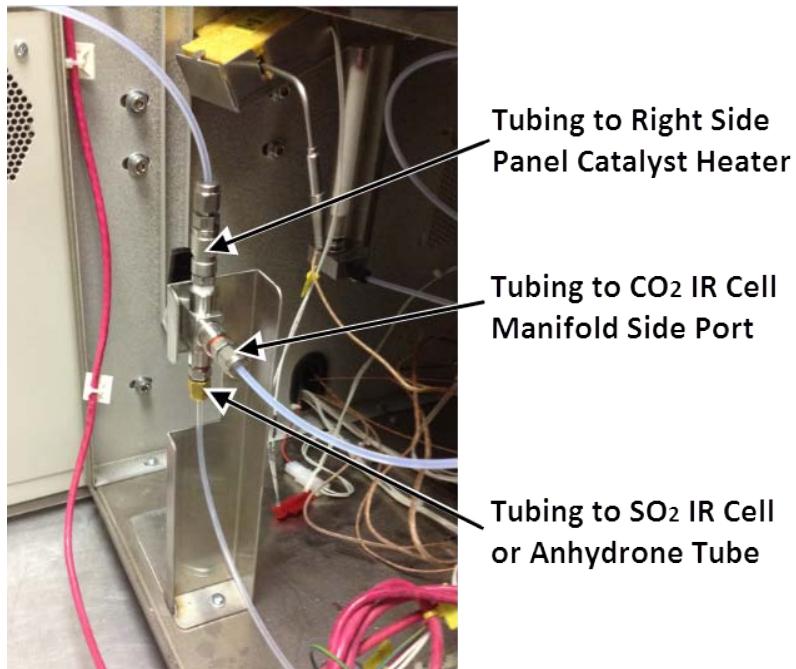


Figure 3-17
Diverter Valve Gas Connections

%\$" 5HUV 'h\Y'[fci bX'ghfUd'Zcf'h\Y'bYk' g]XY'dUbY'"'FYZYf'hC'"
:[i fY'" !% "

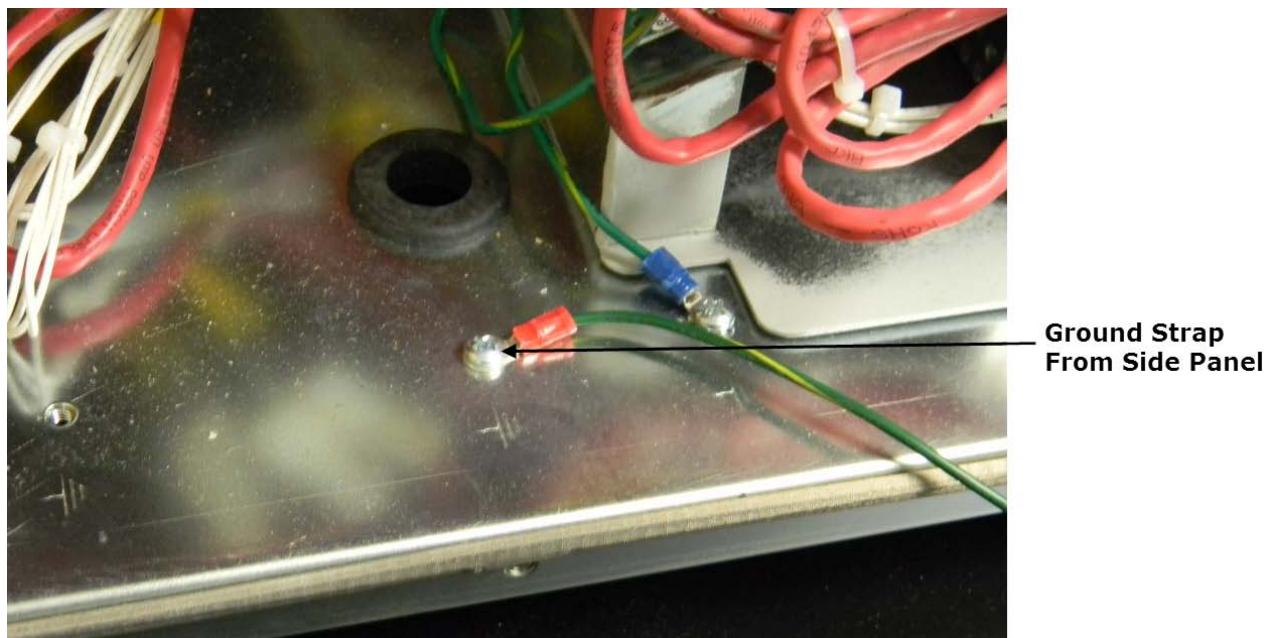
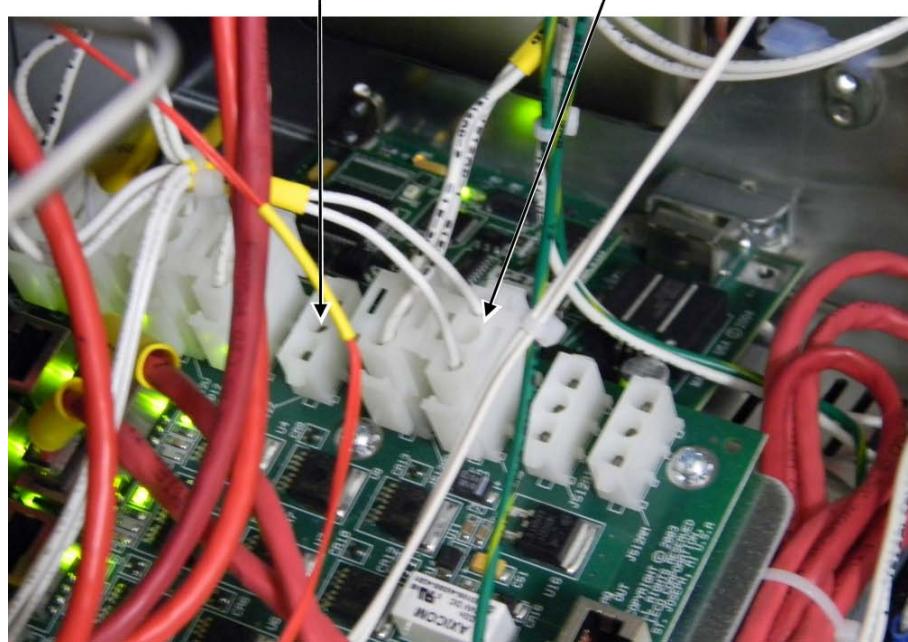


Figure 3-18
Ground Strap

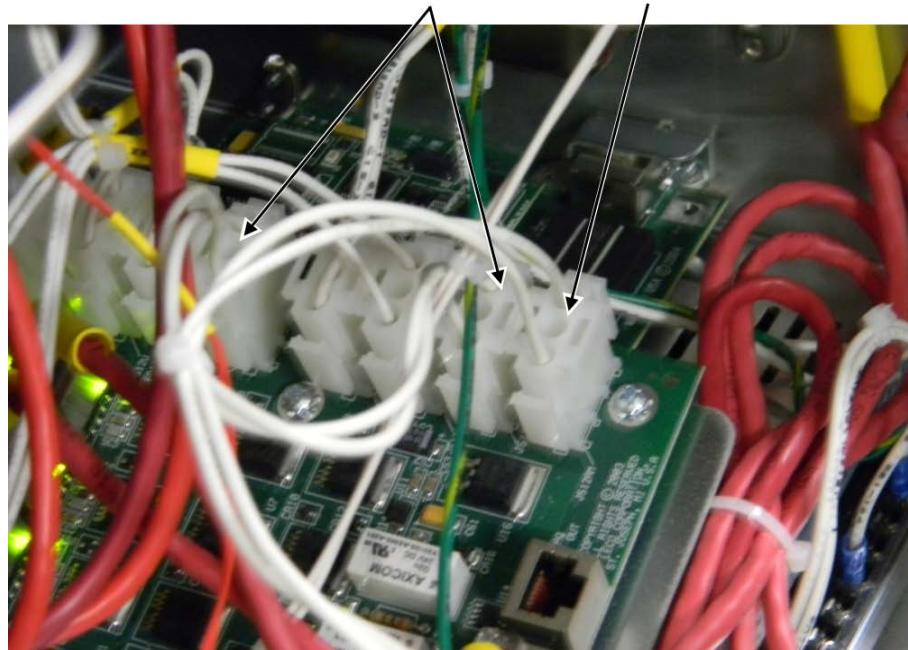
%%" F Ya cj Y \tbbYW\cf Zfca 'h\Y \tbbYW\cb ``UVY'YX'> %&N' cb 'h\Y \tbbYW\cb 'UVY'YX'> %&N' cb 'h\Y \tbbYW\cb ``UVY'YX'> %&5; "H\g'U`ck g'Zcf'h\Y'1 a dYf'hc'VY']bghU'YX' Zfca 'h\Y'g]XY'dUbY'hc'dck Yf'h\Y \tbbYW\gh'YUhYf' FYZYf'hc'h\Y Zc'ck]b['Z[i fY'"

Connector's Old Location Connector In New Location

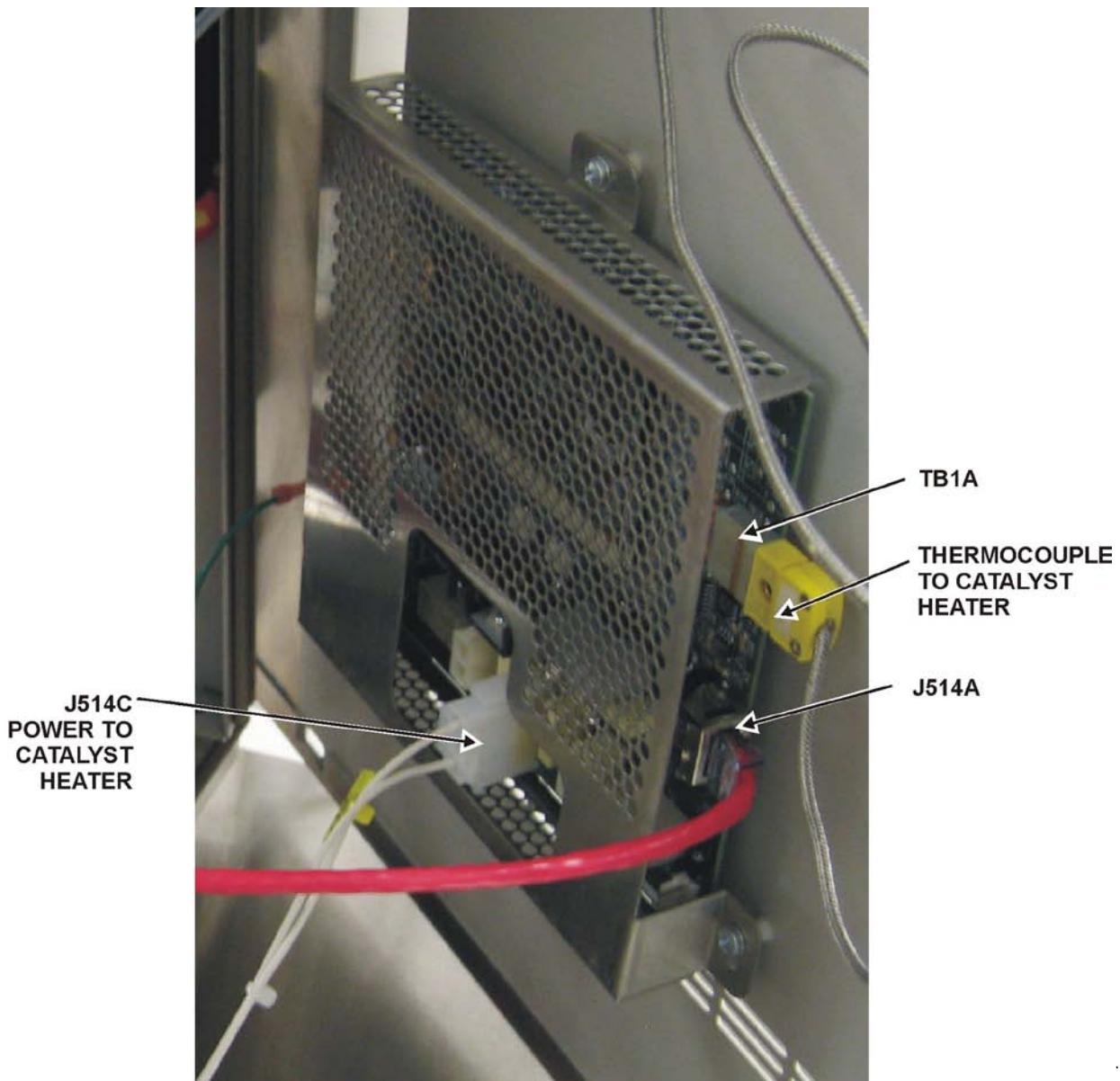


%&" =bghU'1 a dYf'Zfca 'g]XY'dUbY'" D'i ['cbY \tbbYW\cf]b' k \YfY' h\Y \tbbYW\cf]b' cdYb \tbbYW\cb'> %&N' UbX'd'i ['h\Y'ch\Yf']bhc'Yf'cdYb'gdch'UVY'YX'> %&5A' cf'> %&5="5'gc'd'i ['b' h\Y \tbbYW\cf Zcf'h\Y'YUhYf']b' h\Y'fYa U]b]b['cdYb' \tbbYW\cb' FYZYf'hc'h\Y Zc'ck]b['Z[i fY'"

Jumper Heater To Door



% " D'i []b \h Y\YW]dgY\W\W\Y\Zfca \h Y\YUhfY\WbfX\cb \h Y\g]XY\dUbY\]bhc \h Y\YW]dgY\X]ghf]Vi h]cb \WbfX\]bg]XY\h Y\]bghfi a Ybh\FYZYf\hc \h Y\Zc\`ck]b['Z[i fY"



% " -bghU\h Y\bYk\f][\h g]XY\dUbY\z\k]h\W\hU\mgh\YUhf\z\hc\h Y\]bghfi a Ybh\g]b[\h Y\UfXk UfY\Zfca \h Y\cf][\bU\g]XY\dUbY"

% " FYwbbYW\h Y\]bghfi a Ybh\hc\ZUV\]hmidck Yf"

%* " Hi fb\Cb\h Y\dck Yf\gk]hV"

Loading Head and Gas Lines

NOTE →

8c'bch'dYfZcfa'hk]g'dfcWxi fY'i bh]UbU'mn]b[g'Ua d'Yg]b'cl m[Yb'a cXY''K \Yb' gk]hW]b[Zfca 'cl m[Yb'a cXY'hc'Ubmch\Yf'a cXYz'h\Y'XYhYfa]bUhcf'a i gh'VY' fYghcfYX'hc'h\Y'cf][]bU'gY'h'i d"

%" Hi fb'CZZ'h\Y'[Ug'gi dd']Yg"

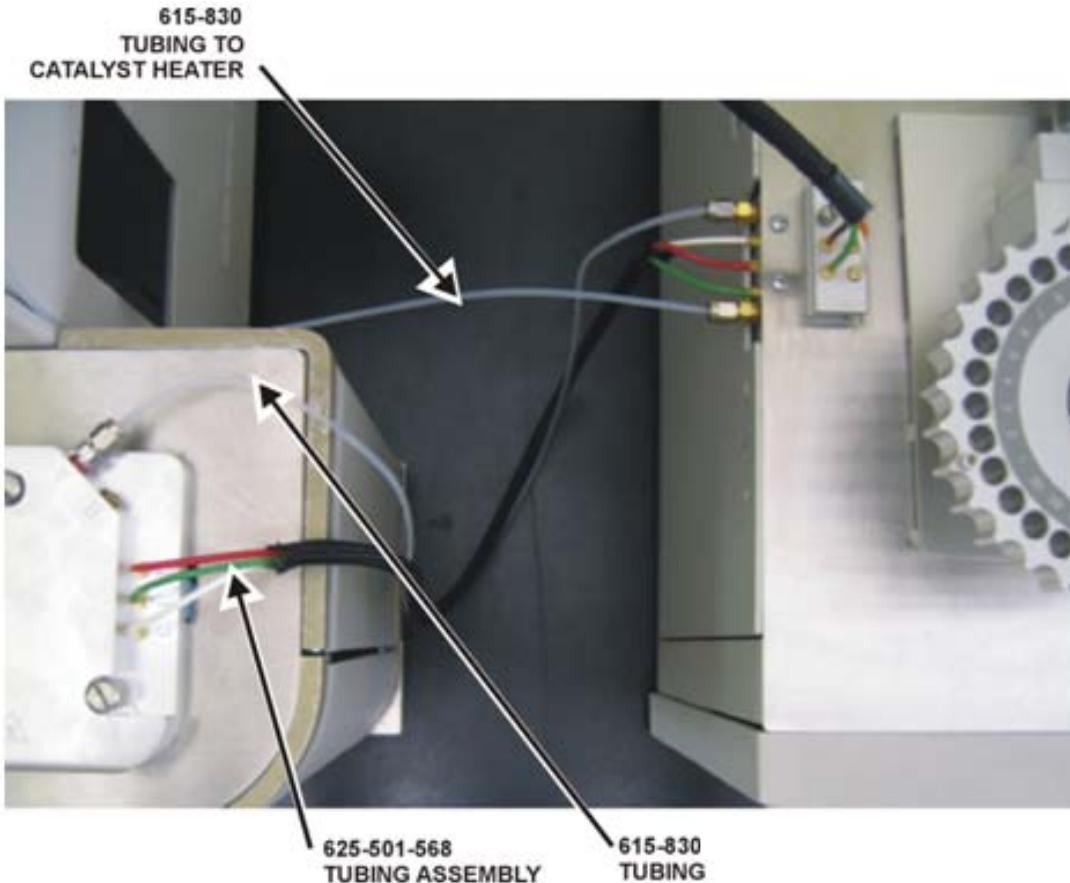
&" 5WYgg'h\Y'gcZhk UfYz'gY'YWM'7cbZ[i fUh]cb'UbX'h\Yb'gY'YWM'GmghYa g" GY'YWM' 9bUV'Y'Cl m[Yb'5XX!Cb"

' " 7cbbYWM'h\Y'[Ug'']bYg'Zcf'h\Y'Cl m[Yb': i fbUV'" 7cbbYWM'h\Y'[Ug'ci h'hc'h\Y'hcd'cZ h\Y'WJHJ'mgh'\YUhYf'UbX'WbbYWM'h\Y'ch\Yf'YbX'hc'h\Y'hcd'cZh'h\Y']bhYfZUW'V'cW'" FYZf'hc':][i fY'" !% z'Zc'ck]b["



Figure 3-19
Catalyst Heater Gas Connection

(" 7cbbYW\h\Y\h\ V]b['VYh\ YYb\ h\Y\ TruSpec'A]Wc'UbX'h\Y'* & , 'C'A cXi 'Y'Ug'g\ck b']b[:][i fY' !&\$\z Zc\ck]b["I gY\h\Y'*%) ! , ' \$'Hi V]b['UbX'h\Y'*&) !) \$%) * , 'Hi V]b[5ggYa V'm'A Uh\W i d\h\Y\Yh\Yfg\cb\h\Y\cUX\YUX]bh\YfZUW'V\cW\hc\h\Y\ WbbYW\cb\cb\h\Y\cl m[Yb\Z fbUW"



**Figure 3-20
Oxygen Add-On Interface**

) " FYa cj Y\h\Y\h\fYY'gWYk g'gYW f]b['h\Y\cUX\YUX\hc\h\Y\ TruSpec'A]Wc'"
* " FYa cj Y\h\Y\UbW\k]h\h\Y\UbW\fYa cj U\hcc\UbX'd\UW\h\Y\UbW\]bg]XY\h\Y\ Xccf'cZ\h\Y\ TruSpec'A]Wc" FYZYf'hc':][i fY' !&%\z Zc\ck]b["



**Figure 3-21
Lance Removal**

+ " =bghU``h\Y`* \$&! , \$' 'C!f]b['UbX'd'UW\H\Y '@cUX' < YUX' =b\YfZUW' 6`cW_ f* \$!\$%\$!
 %(% Zcf'h\Y`* &, 'C'A cXi 'Y'cb 'h\Y' TruSpec'A]Wc'k \YfY' h\Y'c'X'c'cUX' \YUX' k Ug
 fYa c j YX" H][\h\Yb 'h\Y'k fYY'gWYk g'hc'gYW fY']b'd'UW'' FYZf'hc':][i fY' !&"

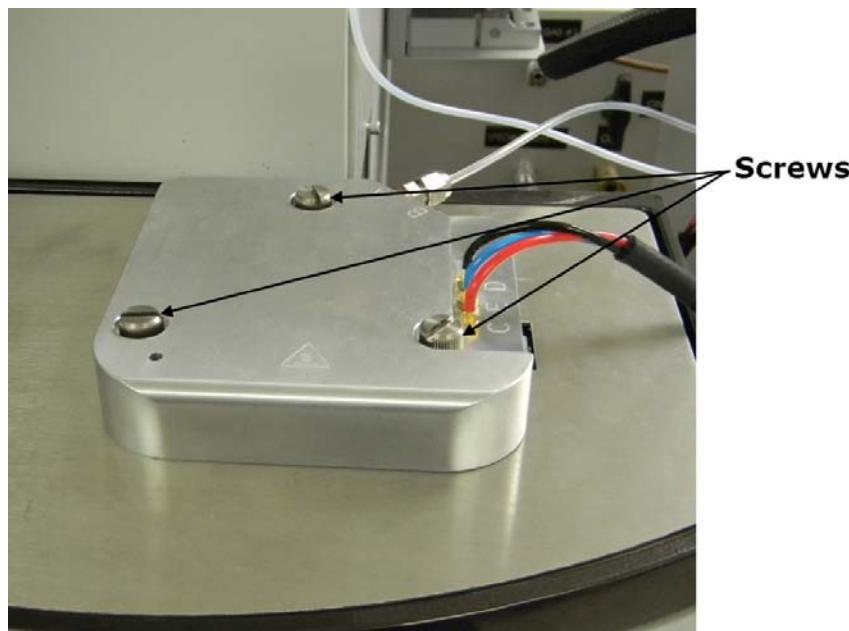
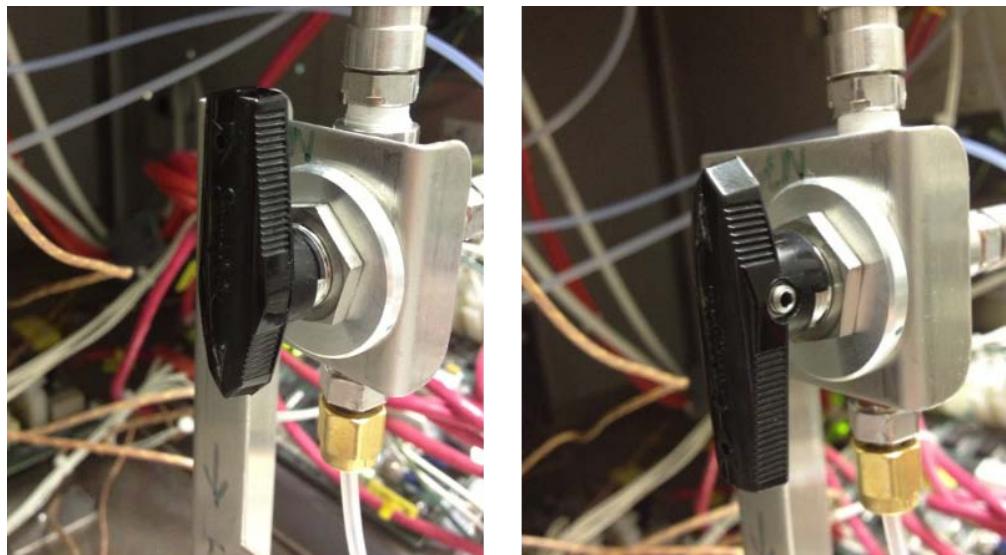


Figure 3-22
Install Load Head Interface Block

F Ya cj Y'h\Y'gWYk 'gYW f]b['h\Y'Xjj YfhYf'j Uj Y'UW\gg'Xccf'UbX'cdYb'h\Y'Xccf"
 Hi fb 'h\Y'Xjj YfhYf'j Uj Y'gc 'h\Y'Uffck 'g'dc]bh]b['i d'hc'fi b'h\Y'jbghfi a Ybh]b'
 cl m[Yb'a cXY"Hi fb 'h\Y'Xjj YfhYf'j Uj Y'gc 'h\Y'Uffck 'g'dc]bh]b['Xck b'hc'fi b'h\Y'
]bghfi a Ybh]b' 7< B#7< BG'a cXY"FYZYf'hc':][i fY' !&' z Zc'ck]b["7'cgY'h\Y'
 UW\gg'Xccf'UbX'fY]bghU' h\Y'gWYk "



Diverter Valve in
 CHN/CHNS
 Mode

Diverter Valve in
 Oxygen Mode

Figure 3-23
Diverter Valve

- " Hi fb 'Cb 'h\Y' [Ug'gi dd`]Yg"
 %\$" DYfZcfa 'h\Y' YU_ 'W\Y\W'_dfc\W\Xi fY'"=Z]h]bX]W\hYg'Ub'm'YU_g']b 'h\Y' gmg\hYa ž'Zfg'h
 h\Ygh'h\Y'W\ff]Yf'UbX'UbU'mnY'Zck '']bYg'i g]b['U'YU_ 'XYh\W\]cb'gc'i h\cb''9bgi fY'
 h\YfY'UfY'bc 'YU_g'V\YzcfY'W\cbh]b["
 %%" D'i []b 'h\Y' Z fbUW'UbX'hi fb 'h\Y' 57'dck Yf'cb' GYh\h\Y' Z fbUW'h\Ya dYfUh fY'Vm
 di g\]b['h\Y'h\Ya dYfUh fY'gYh\X]U'f\c\W\hYX'cb 'h\Y' Zfcbh'cZ\h\Y' Z fbUW']bž'h\Yb'
 h\fb]b['h\W\c\W\k]gY'h\h\Y' Z fbUW'h\Ya dYfUh fY'hc '% \$\$\\$7"
 %&" 5``ck '\$&'hc' '\$'a]bi h\Yg'Zcf'h\Y' Z fbUW'hc'fYUW'cdYfUh]b['h\Ya dYfUh fY'"=Z'h\Y'
 W\ffVcb'V'UW'dck XYf']g'ZfYg\ž'U'ck 'Ub'UXX]h\cbU'%' 'a]bi h\Yg'Zcf'h\Y'W\ffVcb'hc'
 VY'fVU_YX! c\Z'V\YzcfY'dYfZcfa]b['Ub'UbU'mg]g"

Conversion Back to CHN/CHNS

%" Hc 'W\cbj Yfh'h\Y'gmg\hYa 'VUW'_Zcf'7<BG'UbU'mg]g.
 5" DfYgg':, 'UbX'hi fb 'h\Y' [Ug'C: : "
 6" GYh\h\Y'TruSpec'Cl m[Yb'Z fbUW'h\Ya dYfUh fY'hc') \$\$^7"K \Yb'h\Y'
 h\Ya dYfUh fY'g'VY'ck '* \$\$^7ž'fY']Yj Y'h\Y' Z fbUW'dfYggi fY'Vm\Ya cj]b['h\Y'
 fYU[Ybh'hi VY'cb 'h\Y' Zfcbh'cZ\h\Y'Cl m[Yb'Z fbUW'



If the internal pressure is not relieved before removing the loading head, carbon black powder will clog the loading head and coat the work area.

7" F Ya cj Y'h\Y'gW\Yk 'gY\W\f]b['h\Y'X]j Yf\Yf'j Uj Y'UW\Ygg'Xccf'UbX'cdYb'h\Y'
 Xccf'Hi fb 'h\Y'X]j Yf\Yf'j Uj Y'gc'h\Y'Uffck 'g'dc]b\h]b['Xck b'hc'fi b'h\Y'
]bg\hfi a Ybh]b['h\Y'Zfb'7<BG'a cXY''FYZf'hc':][i fY' !& ''7'cgY'h\Y'UW\Ygg'
 Xccf'UbX'fY]b\h\Y'gW\Yk "
 8" F Ya cj Y'h\Y'Ya d\h\m5'e]ei ch'G\W\i VVYf'H VY'UbX'fYd'UW']h\k]h\h\Y'dUW\YX'
 h\Y'VY''FYZf'hc' DUW\]b['h\Y'FYU[Ybh'hi VYž'dU[Y'&E%\$"
 9" DfYgg':, 'UbX'hi fb 'Cb 'h\Y' [Ug"
 : " GY'Y\W\i 7cbZ][i fUh]cb'UbX'gY'Y\W'Gmg\hYa " GY'Y\W\i 8]gUV'Y'Cl m[Yb'5XX! Cb"

Packing the Oxygen Catalyst Tube

NOTE →

H\Y'CI m[Yb '7UhU`ngh<YUhYf`]g`cW\hYX`cb`h\Y`f][\h\g]XY`dUbY`cZh\Y`
XYhYfa]bUhcf".



WARNING →

Use caution to prevent serious burns. If the catalyst tube is being repacked wait for the catalyst heater to cool performing the following steps.

- %" @ccgYb `h\Y`gW\Yk`]b`h\Y`fYa cj U`V`cW`UbX`fYa cj Y`h\Y`V`cW`Zca`h\Y`hcd`cZh\Y`
W\hU`ngh`YUhYf`h\Y`VY`Di`h\Y`W\hU`ngh`YUhYf`Xck b`UbX`fYa cj Y`h\Y`h\Y`VY`FYZYf`
h\Y`][i fY` !&(ž'dU[Y` E`) "
- &" Di g\`h\Y`)\$%* &%`7cddYf`Hi`fb]b[g`bhc`h\Y`W\hU`ngh`YUhYf`h\Y`VY`i`bh`%`]bW`cZ`
h\Y`h\Y`VY`g`Z`YX`H\Y`W\hU`ngh`fb]b[g`g\ci`X`fYgh`Uh`h\Y`bYW`UVcj`Y`h\Y`bUffck`
gYW`cb`cZh\Y`h\Y`VY`
- ' " Dci f`)\$`[fUa`g`)\$%+\$`F`UfY`9UfH`7cddYf`CI`]XY`cbhc`h\Y`W\hU`ngh`fb]b[g`i`bh`
UddfcI`ja`UhY`m`#`cZh\Y`h\Y`VY`g`Z`YX`cf`h\Y`VchhY`g`Ya`dhm`
- (" =bgYfh`h\Y`dUW`YX`W\hU`ngh`YUhYf`h\Y`VY`]bhc`h\Y`W\hU`ngh`YUhYf`UbX`di`g\`jh`cj`Yf`
h\Y`c!f]b[`cb`h\Y`ck`Yf`V`cW`"

) " Di g\ 'h\ Y'W\hU\mgh\YUhYf'i d'UbX]bghU\h\Y'FYa cj U'6`cW"

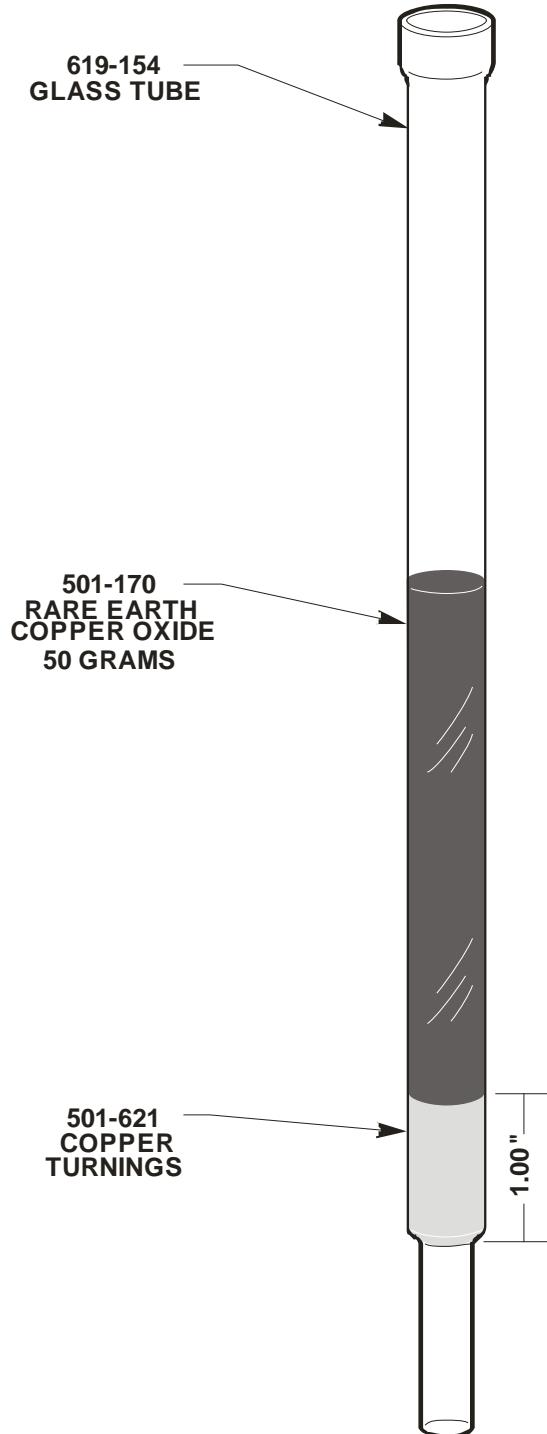


Figure 3-24
Oxygen Catalyst Heater Tube Packing

Operation

Controls and Indicators

Power On/Off Switch—Gk]hW Yg'dck Yf'cb'UbX'cZZ'h' h\Y'Z' fbUW" 5'gc'UWg'Ug'U' WfW]h'VfYU_Yf'cb' h\Y']b'Wta]b['ZUW]hm'']b'Y'dck Yf"=h'g'`cWWhYX'cb' h\Y'YZh'g]XY'cZ'h\Y' Z' fbUW"

Temperature Display—H\jg'@98'k']bXck 'X]gd'Umg'h\Y'gYh'UbX'W ffYbh'Z' fbUW' h\Y'a dYfUh' fYg"

Temperature Set Dial—Di g\ 'h\]g'X]U']b'UbX'hi'fb']h'h'c'gYh'h\Y'Z' fbUW' h\Y'a dYfUh' fYz' WcW_k'gY'Zcf'Ub']b'WYUgYz'Vt' bhyfWcW_k'gY'Zcf'U'XYWYUgY''FYYUgY' h\Y'X]U'k'Yb' h\Y' h\Y'a dYfUh' fY']g'dfcdfYf'migYh''H\Y'W ffYbh'h\Y'a dYfUh' fY']g'g\ck b'cb' h\Y'X]gd'Uml' 5bU'ng]g'Wb'VY[]b'cb'W' h\Y'Z' fbUW'X]gd'Umg'h\Y'gYh'h\Y'a dYfUh' fY''Bca']b'U' h\Y'a dYfUh' fY']g'%' \$\$^{\circ}7"

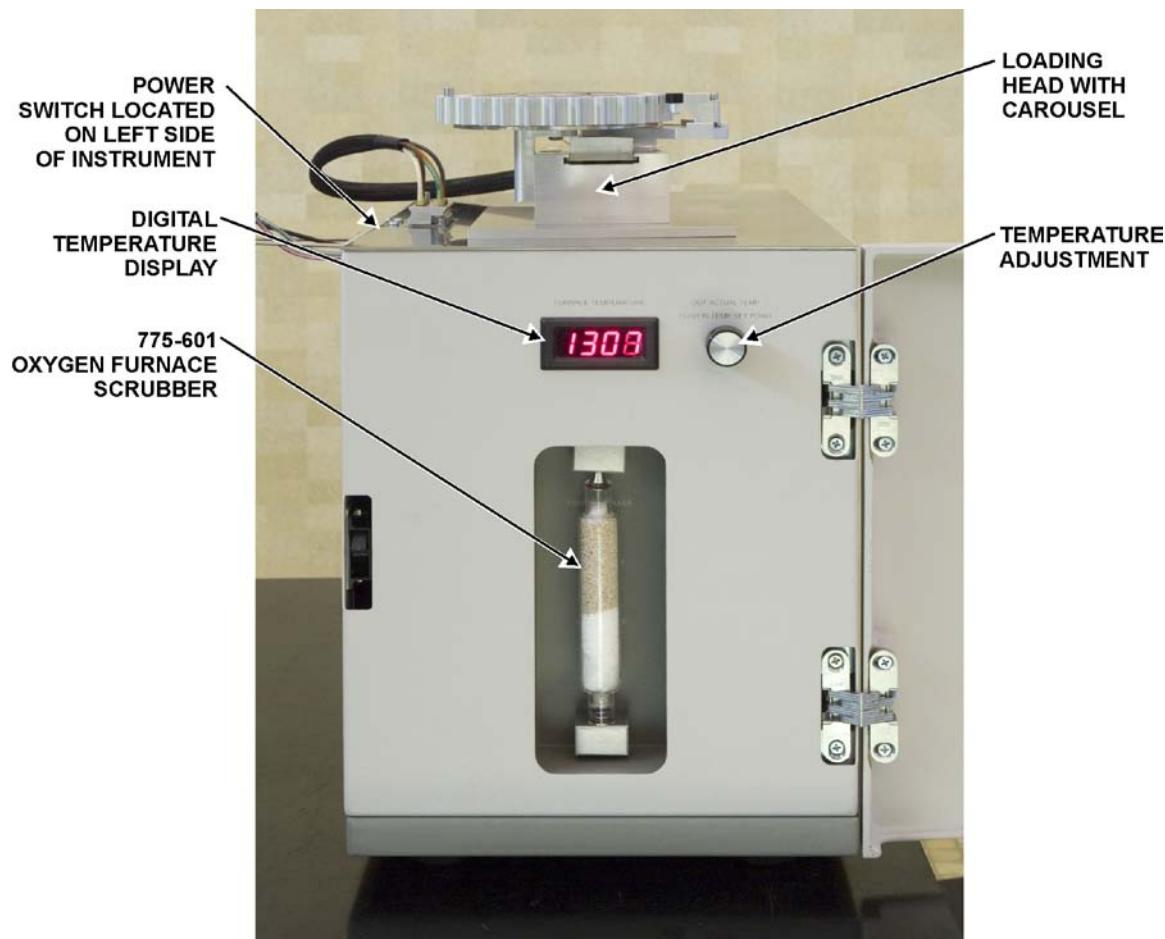
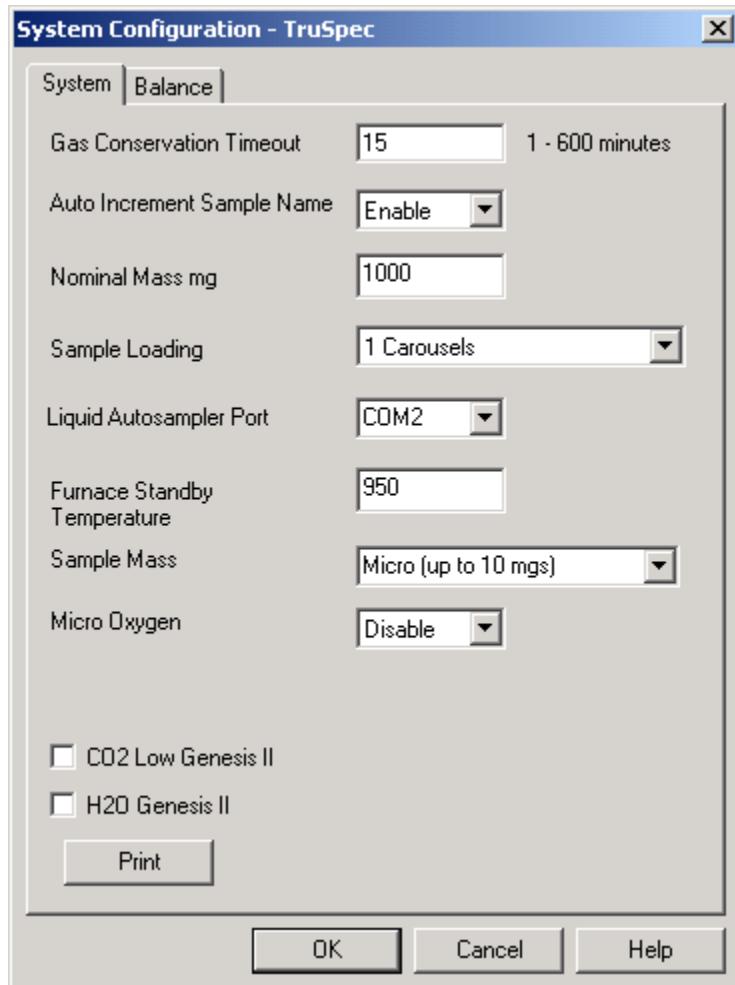


Figure 3-25
Controls and Indicators

Setup

%" Hi fb'Cb'hY'57'dck Yf'UbX'[Ug'gi dd`]Yg'hc'Vch'hY'TruSpec'A]Wfc'8YhYfa]bUhcf'UbX'* &, 'C'A cXi 'Y'"
&" GYh'hY'* &, 'C'A cXi 'Y'hYa dYfUh fY'hc'% \$\$^7'FYZYf'hc'7cbhfc'g'UbX'=bX]Wfcfgz'dU[Y' E'*"
" GY'YW'hY'7cbZ[i fUh]cb'a Ybi 'UbX'hYb'gY'YW'GmghYa ''HhY'GnghYa
7cbZ[i fUh]cb'gWYYb'k]''UddYUf"
(" GY'YW'hY'A]Wfc'CI m[Yb'Xfc! Xck b'Uffck 'UbX'gY'YW'9bUV'Y"



) " GY'YW'hC?"'5'X]U'c['Vcl 'a UmUddYUf'fYa]bX]b['hY'cdYfUhcf'hc'WbbYW'hY'[Ug'']bYg'Zfc a 'hY'XYhYfa]bUhcf'hc'hY'* &, 'C'A cXi 'Y'J Yf]ZmHh Uh hY'[Ug'']bYg'k YfY']bgH'YX'UbX'gY'YW'C?"'
* " GY'YW'hY'7cbZ[i fUh]cb'a Ybi 'UbX'hYb'gY'YW'A Yh\cXg''HhY'A Yh\cX'gWYYb'k]''UddYUf"

+ " 7fYUhY' U'a Yh\cX'Zcf'cl m[Yb'UbU'mg]g" FYZf'hc' 7fYUhj['U'A Yh\cX'Z'dU[Y' (E(())
Hc'ghUfh'i gY'h\Y'j U'i Yg'jb' h\Y'Zc'ck]b['hUV'Y'"=ZbYVggUfmh\Y'j U'i Yg'a Um'VY'
WUb[YX'hc'a YYh'mci f'bYYXg"

Analysis Parameters	
7ca Vi ghjcb': i fbUW'HYa dYfUh fY'	-) \$c7
Element Parameters	
5bUmY'	Mg'
6UgY']bY'8Y'UmH]a Y'	%'gYVtbXg'
A]b]a i a '5bUm]g]H]a Y'	* \$'gYVtbXg'
7ca dUfUhcf '@Yj Y'	%"\$"
9bX]b['H]a Y'	%gYVtbX'
7cbj Yfg]cb': UWfcf'	%"\$"
G][b]ZWbh'8][hg')

" GY'YVh'h\Y'7cbZ[i fUh]cb'a Ybi' UbX'h\Yb'gY'YVh'7ci' b\Yfg''H\Y'A U]bhYbUbW'
7ci' b\Yfg'gWVYb'k]' UddYUf''H\Y'cl m[Yb'Wt'i b\Yfg'a Um'VY'YZh'Uh'h\Y'ZUWfcfm'
XYZUj'hgj'ghYX']b' h\Y'Zc'ck]b['hUV'Y'Zcf'YX]hYX'Ug'XYg]fYX" FYZf'hc'
7cbZ[i f]b['A U]bhYbUbW'7ci' b\Yfg'zdu[Y'*E'*"

	Oxygen Add-On Reagents	Oxygen Add-On Scrubber
HmdY'	5bUm]gYg'	5bUm]gYg'
7ci' b\h'6'Ub_g'	Mg'	Mg'
7ci' bh'	\$'	\$'
K_Ufb') \$\$'	* \$\$'
Ghcd'	\$'	\$'
FYgYhg'	('	('

Sample Preparation

Hc`dfYj Ybh`WbHJa]bUh]cb`cb`m`UbX`Y`h`Y`Wldgi`Yg`k]h`ZcfWldgi`7f]a d`Wldgi`Yg`cb`U`VYUb`gi fZUW`gi W`Ug`Ub`]bj YfhYX`VYU_Yf": cf`a]Wc`Udd`]Wb]cbgž@97C`fYw`a a YbXg`U`*!d`UW`VU`UbW`%` D`UW`h`Y`a]Wc`Wldgi`Y`cb`h`Y`VU`UbW`i g]b[`ZcfWldgi`&` DfYgg`HufY`hc`HjfY`h`Y`VU`UbW`' " 5XX`g`a d`Y`hc`h`Y`a]Wc`Wldgi`Y`VY]b[`WfYZ` `bch`hc`gd]` Ubmicb`h`Y`VU`UbW`dUb`" (" FYa cj Y`h`Y`a]Wc`Wldgi`Y`Zca`h`Y`VU`UbW`UbX`W]a d`Ug`g`ck b`]b` :]i fY` !&* ž`dU[Y` E` - ") " D`UW`h`Y`W`a d`YX`a]Wc`Wldgi`Y`cb`h`Y`VU`UbW`UbX`fYw`fX`h`Y`a Ugg`

Tools	LECO Part Number
H]b`7Udgi`Yg`	* \$% - *` cf`) \$&! &&+
D`Yfg`	* \$% - * (
: cfWldgi`	* %- ! +&*
GdUh`U`	* %- ! +&)

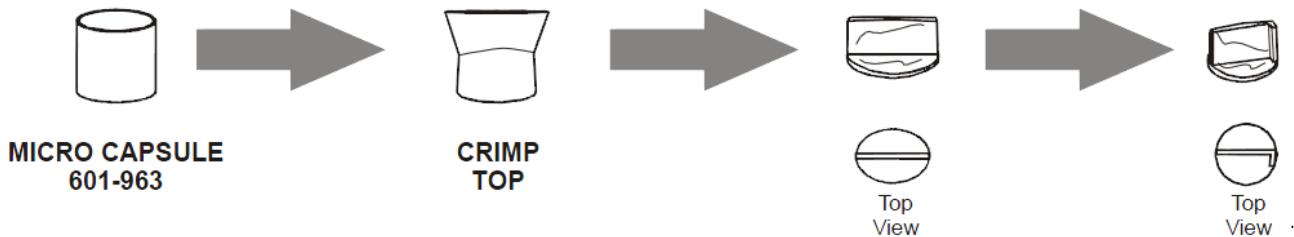


Figure 3-26
Sample Preparation-Microcapsule

Sample Analysis

5ZhYf`gYh`d`UbX`a`Yh`cX`XYj`Y`cda`Ybh`cl`m`Yb`UbU`ng]g`k`]h`h`Y`* &`C`A`cXi`Y`]g`h`Y`g`a`Y`Ug`h`Y`TruSpec`A`]Wc`"FYZYf`hc`5bU`m]b[`U`GUa`d`Y`dU[Y` E%`"

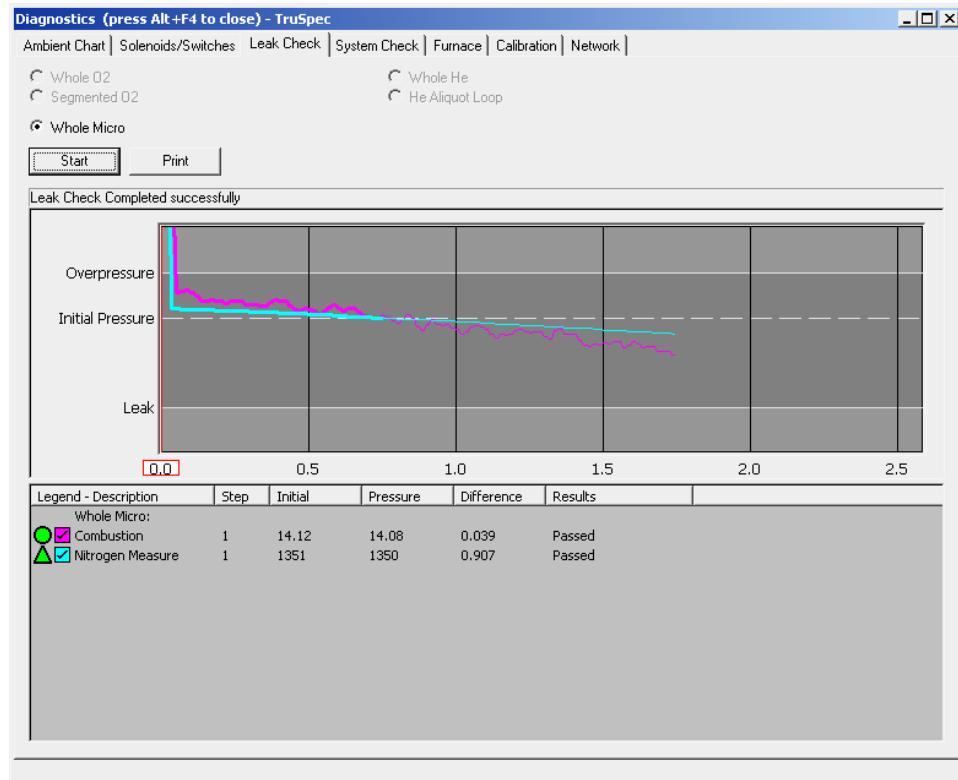
Leak Check, 628 O Module

Hc'dYfZcfa 'U'YU_`W YWžgY'YVWGHUfh'K \c`Y'a]Wc'k]``Ui hca Uh]W`mVY'gY'YVWYX''
H\]g'g'HK Y'cb'migY'YVW]cb 'Uj U]UV'Y''

H\]g'dfcWXi fY'W YWg'Vch\`h Y'XYHfa]bUhf'UbX'h Y'* & 'C'A cXi 'Y''

Hc'dYfZcfa 'U'YU_`W YWžfYZYf'h'c'HK Y '@YU_7\YW'dfcWXi fYž'dU[Y', È%("

Leak Check Screen Example



Periodic Maintenance, 628 O Module

H\Y'Zc`ck]b['g\W YXi 'Y]g U`]gh`cZa U]bhYbUbW`dfcW\Xi fYg`h\Uhig\ci 'X`VY`
dYfZcfa YX`cb`U`fY[i `Uf`VUg]g": cf`a cfY`]bZcfa Uh]cb`W\fb]b['dYf]cX]W
a U]bhYbUbW`UbX`dYf]cX]Wa U]bhYbUbW`dfcW\Xi fYg\z`fYZf`hc`h\Y`]bX]j]Xi U`
hcd]W\".



CAUTION

In order to obtain the best possible analysis results, periodic maintenance must be performed at the intervals listed as follows.

Before performing any of the procedures listed as follows, cool the furnace to less than 600°C and relieve the furnace pressure by removing the reagent tube on the front of the oxygen furnace. If the internal pressure is not relieved before removing the loading head, carbon black powder will clog the loading head and coat the work area. If the load head is removed while furnace temperature is greater than 600°C, severe damage to the 608-130 Glass Carbon Inner Furnace Tube may occur.

Maintenance Item	Location of Maintenance Item	Inspection, Cleaning, and Maintenance Interval
7 UhU`ngh<YUhYf` fCl m[Yb` : i fbUW\`	@cW\hYX`cb`f][\h\g]XY`dUbY`cZ XYhYfa]bUhcf"	FYd`UW`Yj Yfm* \$\$`UbU`ng]g" FYZf`hc`DUW]b['h\Y`Cl m[Yb` 7 UhU`ngh Hi VY\z`dU[Y` E` ("
7 fi W\`Y`	=bg]XY`Z`fbUW`W\`a Vi gh]cb`hi VY`	FYd`UW`Yj Yfm%\$\$`UbU`ngYg" FYZf`hc`DUW]b['UbX` =bgH`]b['h\Y` : i fbUW` Hi VYg\z`dU[Y` E&%"
Cl m[Yb` : i fbUW` GW\`i VVYf`	6Y\`]bX`Z`cbh`Xccf`cZ* &, 'C` A cXi `Y`	7\Y\`XU]mUbX`fYdUW`k\Yb` Anhydrene W\`Yg`cf`LECOSORB` W\`Ub[Yg`W\`cfg`fUVci h`* \$\$` UbU`ngYg`E`FYZf`hc`Cl m[Yb` : i fbUW`GW\`i VVYf\z`dU[Y` E` %
Cl m[Yb` : i fbUW` F YU[Ybhg`fW\`fVcb` V`UW\`	* &, 'C`A cXi `Y`W\`a Vi gh]cb`hi VY` Hi fb`[Ug`cZ\`fYXi W\`Z`fbUW` h\`a dYfUh`fY\`k UjhU`Z\`k`a`]bi h\`g` Zc`dfYggi`fY`hc`Xfc`d`hc`nYfc\`UbX` fYa`cj`Y`]b`Yf`W\`a Vi gh]cb`hi VY`	FYd`UW`Yj Yfm) \$\$`UbU`ngYg" FYZf`hc`DUW]b['UbX` =bgH`]b['h\Y` : i fbUW` Hi VYg\z`dU[Y` E&%"
G`]X]b['6`cW`UbX` @cUX]b['<YUX`	Cb`hcd`cZ`h\Y`* &, 'C`A cXi `Y`	H\Y`cUX]b['YUX`g\ci 'X`VY`]bgdYW\`X`k YY`_mUbX`W\`UbYX` Ug`bY\`ggUfm`FYZf`hc` 7`YUb]b['h\Y`G`]X]b['6`cW` UbX`@cUX]b['<YUX\z`dU[Y` `E`(&"

Cleaning the Sliding Block and Loading Head

H\Y'g]X]b['V\cW\UbX\cUX]b['\YUX'g]ci 'X\Y]bgdY\WYX'K YY_\mUbX\WYUbYX'Ug'bYYXYX'

NOTE → H\Y\cl m[Yb\Z fbUW\h\ya dYfUh\ fY\ a i gh\VY\ ``Ygg\h\ Ub\ ``\$``7 `VYZcfY\h\]g\dfcW\Xi f\Y\]g\ dYfZcfa\ YX.

FYZf'hc :][i fY' !&\$ž'dU[Y' E' %ž'k \ Yb 'dYfZcfa]b['h\]g'dfcWxI fY'

%" GYh h Y ; Ug Gk]hW hC C ZZ

&" F Ya cj Y'h\Y'Wlfci gY'z]Zi gYX"

6f]YZm^]Zh i d \h Y fYU[Ybh\h VY ``cVW\h Y cb \h Y Zfcbh\h cZ\h Y cl m[Yb \h fbUV\h hc
fYa cj Y gmgh\h Ya ``dfYggi fY ``FYZYf\h c :][i fY `` ! &) \h dU[Y `` E `` * ``

(" @ccgYb\h\h Y\gWYk\UbX\fYa\cj\Y\h\h Y\dbYi\ a\Uh\h W[\Ug\`a\Ub]Zc\X\UggYa\V'm\Zca\h\h Y\h\h cd\cZ\h\h Y\TruSpec\cC"\FYZf\hc":][i\ fy"! (\% \dU[Y\h\h E) - "

) " FYa cj Y\H Y\` UbX\Y\d]b" \Hn Jg\d]b \c\Xg\H Y\g]X\b[\V\cW\hc\H Y\d]ghcb\g\Uz\H
FYZyf\hc :] i fY" ! (%\z dU[Y\` \E) - "

* " F Ya cj Y'h Y'g]XY'V'cW_"-=Z'h Y'j]Yk]b[`dcfh]g'X]fhmcf]Z]h]g'gi gdYVWYX'h Uh'h Y']b hYfbU'c! f]b[`a UmVY'YU_]b[`z'fYa cj Y'h Y'j]Yk]b[`dcfh'd]ghcb'VmUdd'm]b['U`ck`dfYggi fY'h Y'dbYi a Uh]WZ]h]b["7'YUb'h Y'dcfh'UbX'k]bXck]b'h Y'g]XY' V'cW_-

+ " 7`YUb`h Y`gYU`d]ghcb`k]bXck g`UbX`U`gi fZUWg`7`YUb`UbX`][`h\m[fYUgY`h Y`gYU`d]ghcb`c!f]b[g"FYd`UVW`h Y`c!f]b[`Z]h`g`k cfb`cf`XUa`U`YX"

7`YUb`UbX`][\hm{fYUgY}`\h{Y`c!f}][\cb{\h{Y`Vchca}}`[\ch{Y`g}]X]b[`\v{cW\k}\h{g}]`MebY`[fYUgY`]\Fy{d`UW\h{Y`c!f}][\Z]h{k`Ug{k`cf`Xu{a`U`YX`}

- " 7`YUb`U``gi fZUWg`cZH\Y`cUX]b[`\\YUX`V`cW_`YI dcgYX`VmH\Y`fYa cj U`cZH\Y`g]X]b[`V`cW``"

%" FY|bgHU`~`H Y|gYU`d]ghcb`k]H`c!f]b[g``H Y|d]ghcb`g]bgHU`YX`WtfYVWm]Z H Y|gYU`c!f]b[`g`YI dcgYX`"

%%" @ccgYb\H Y\H\ i a VgWYk g\UbX\d\UW\H Y\cUX]b\ ``YUX'UggYa\`micb\U'k cf_\gi fZUW

%&" Hi fb `h\Y`cUX]b[`YUX i dg]XY Xck b `UbX]bgdY\h\Y i bXYfg]XY`-Z]h]g \WYUb `UbX
mci `gi gdYW\bc ``YU_gz`g_]d `hc `ghYd %*`/ch\Yfk]gY `dYfZcfa `h\Y Zc ``ck]b[`ghYdg"

5" FYa cj Y'hk Y'hk c'gWYk g]b'hk Y'Uf[Y'Wn]bXYf a ci bh]b['V'cW"

6" FYa cj Y'h Y`cWWhjb['d]b gWYK 'Zca 'h Y'g]XY cZ'h Y`cUX]b['\YUX"

7" FYa cj Y\z'WUb\z'UbX\`][\h{m}[fYUgY\h{Y\c!f]b[\z\`cV\h{YX\`bg]XY\h{Y\c\h{V\h{b[\`d]b\`gW\h{Yk\`c\`Y\`

8" FYa cj Y'h\Y'W\j

UbX d]grcb acf\h\c Y \z\h\Y\j g\w\er\j[cb \h\Y d]grcb z\Yd uw jn / Yub ubx
`][\h\m[f\YUgY \h\Y ga U``UbX \h\k c ``Uf[Yf`!f]b[g`
9" F\Y\bg\hU``\h\Y W\h\l bXYf` a ci b\h\l b[`V\cW\z a U \l b[q\i f\Y \h\Y [fcc\i Y\cb \h\Y

d]ghcb]g'U][b'YX'k]h' h' Y' c'Wjh'b[d]b' g'WYK 'cb' h' Y' g]XY c'Z'h' Y' V'c'W' '5'][b' h' Y' g'Ua d'Y' \c' Y' V'm'a Ub]di 'Uh]b[h' Y' d]ghcb 'Ug]h' g]f'Y]bg'Yfh'YX][b'hc' h' Y' 'c'UX]b['\YUX' 'F'Y]bg'hU' 'h' Y' g'WYK g]b' h' Y' W'h]b'XYf'a ci b'h]b['V'c'W' 'H' Y' \YUX c'Z'h' Y' c'Wjh'b[d]b' g'WYK 'g\ci 'X' V'Y' Zi g' k]h' h' Y' g]XY c'Z'h' Y' 'c'UX]b['\YUXz' g'YUh'YX'U[U]bg'h' h' Y' c'!f]b['UbX' Zcfa]b['U'g'YU'U[U]bg'h' h' Y' d]ghcb 'c'Y' '8c' b'ch' Zcf'W' h' Y' d]b' g'WYK 'b']h' k']' X'Ua U[Y' h' Y' d]ghcb 'Z' b'ch' U][b'YX' df'cd'Yf'm'

NOTE

=ZbYYXXYXžfY]bgħU``ħħY[Ug'a Ub]Zc'X'hc'[YħiħħY'd]għċb'hc'Zi ``mYI hYbX']bħċ'ħħY
V`cW_''HħY'i gY'cZU''# & ``YI 'k fYbWžcf'għa]Uf'X]Ja YħYf'hċċ'ži]bgħYfħYX']bħċ'ħħY
V`cW_għa d'Y\c'Yħħfci [\ ħħY'd]għċb'c'Yżċfa ħħY'Vchħċa Wħib'U]X]b'U][ba YbhċiZ
ħħY[fcj Yżċf'ħħY'U][ba Ybh'd]b'għWYK ''
% " 7`YUb'UbX`][\ħim[fYUgY'ħħY'c!f]b['cb'ħħY'għa d'Y'Xfcd'd'UħY''
%(" FY]bgħU``ħħY`cUX]b[``YUX'UggYa V'mi
%) " FY]bgħU``ħħY'g]X]b['V`cW_ UbX'għWfY'jh'k]ħi ħħY'\ UbX'Y'd]b''=ZħħY'd]b'XcYg'bċċi
g']XY]b'YUg]nżfYU][b'ħħY'\c'Y']b'ħħY'Wħi]bXYf'għUži
%* " FY]bgħU``ħħY[Ug'a Ub]Zc'X'UggYa V'miUbX'ħi][\ħħb'ħħY'għWYK 'hc'għWfY']ħi
%+ " DYfŻċfa U`YU_ WħYW''FYZYf'hc'@YU_7\YWždu[Y', E%''

Adjusting the Furnace Temperature



ELECTRICAL SHOCK HAZARD

Hazardous voltages are present within this unit. Use caution when performing this procedure.

- %" GYh\h\Y[Ug'gk]h\W'CZ"
- &" GYh\h\Y\Z fbUW'dck Yf'gk]h\W'CZ'UbX'X]g\WbbY\W\h\Y\Z fbUW'Zfc a \h\Y'ZUW]hm dck Yf"
- ' " F Ya cj Y\h\Y\Z fbUW'f][\h\gjXY'dUbY'UbX'cW\hY\h\Y: i fbUW'7cbhfc'7Ufx'FYzf' hc:[i fY'!+&\dU[Y' E()
- (" 7cbhfc'g'F)) \Z F * UbX'F*('Uj Y'VYYb'gYh'Uh\h\Y'ZUW]cfm' = Z h\YgY'Wbhfc'g' g\ci 'X'bYYX'UX'i gha Ybh\Z'cW\hY\h\Y'Wbhfc'g'UbX'UX'i gh'Wbhfc'F)) 'hc'h\Y%' c\WcW'_dcg]h]cb\Z F) * 'hc'h\Y'&c\WcW'_dcg]h]cb'UbX'F* ('hc'h\Y'%&c\WcW'_dcg]h]cb' h\Y'a]XX'Y'fUb[Y'cZ\h\Y'Wbhfc'g'g\h\Y'%&c\WcW'_dcg]h]cb"
-) " Hi fb'F*) 'W\ a d'YhY'm\Wt\ b\hYf'WcW_k]gY'hc'gYh\h\Y'WffYbh'ja]h\hcnYfc"
- * " Hi fb'\h\Y\Z fbUW'h\Y a dYfUh\ fY'Wbhfc'W\ a d'YhY'm\Wt\ b\hYf'WcW_k]gY'hc'gYh\h\Y' h\Y a dYfUh\ fY'hc'nYfc"
- + " D'i ['\h\Y\Z fbUW']b'UbX'gYh\h\Y'dck Yf'gk]h\W'Cb"
- , " CVgYfj Y\h\Y'Wbhfc'W\Wfx"
- 5" H\Y'mY'ck '@98'g\ci 'X'VY'CZ"
- 6" H\Y'fYX '@98'g\ci 'X'VY'CZ"
- " D'UW'h\Y'dcg]h]j Y'f\Z \h\Yfa]bU'cZ\h\Y'X][]h\U'j c\ha YhYf'cb'HD%" D'UW'h\Y[fci bX' h\Yfa]bU'cb'HD- "5X'i gh'F' fCj Yf! h\Y a dYfUh\ fY\Z i b\h\Z\h\Y'X][]h\U'j c\ha YhYf'fYUXg' +%" j c\hg'Uh'HD%"
- %" D'UW'h\Y'dcg]h]j Y'f\Z \h\Yfa]bU'cZ\h\Y'X][]h\U'j c\ha YhYf'cb'HD%" '@Uj Y\h\Y' [fci bX' h\Yfa]bU'cb'HD- "5X'i gh'F&('i b\h\Z\h\Y'X][]h\U'j c\ha YhYf'fYUXg'\$&, j c\hg' Uh'HD%"
- %%" F Ya cj Y\h\Y'X][]h\U'j c\ha YhYf"
- %&" Hi fb'\h\Y\Z fbUW'h\Y a dYfUh\ fY'Wbhfc'WcW_k]gY'hc'gYh\h\Y\Z fbUW'hc'XYg]fYX' cdYfUh]b[h\Y a dYfUh\ fY'fbca]bU']g'%" \$\$'7\Z"
- % " G'ck'mUX'i gh'F*) f\Z i ffYbh@ja]h\Z i b\h\Z\h\Y'X][]h\U'j c\ha YhYf'fYUXg'\$%") j c\hg'Uh' HD, "5g'F*) 'g'UX'i gh'YX\Z\h\Y'fYX '@98'g\ci 'X'][\h\i d'UbX'h\Y'mY'ck][\h\g\ci 'X' VY'CZ' h\Y'YU\h]b['Y'Ya Ybh'k]'VY'fY\W]j]b['WffYbh'UbX'h\Y\Z fbUW'g\ci 'X' VY[]b'fUa d]b['hc'gYh\h\Y a dYfUh\ fY"

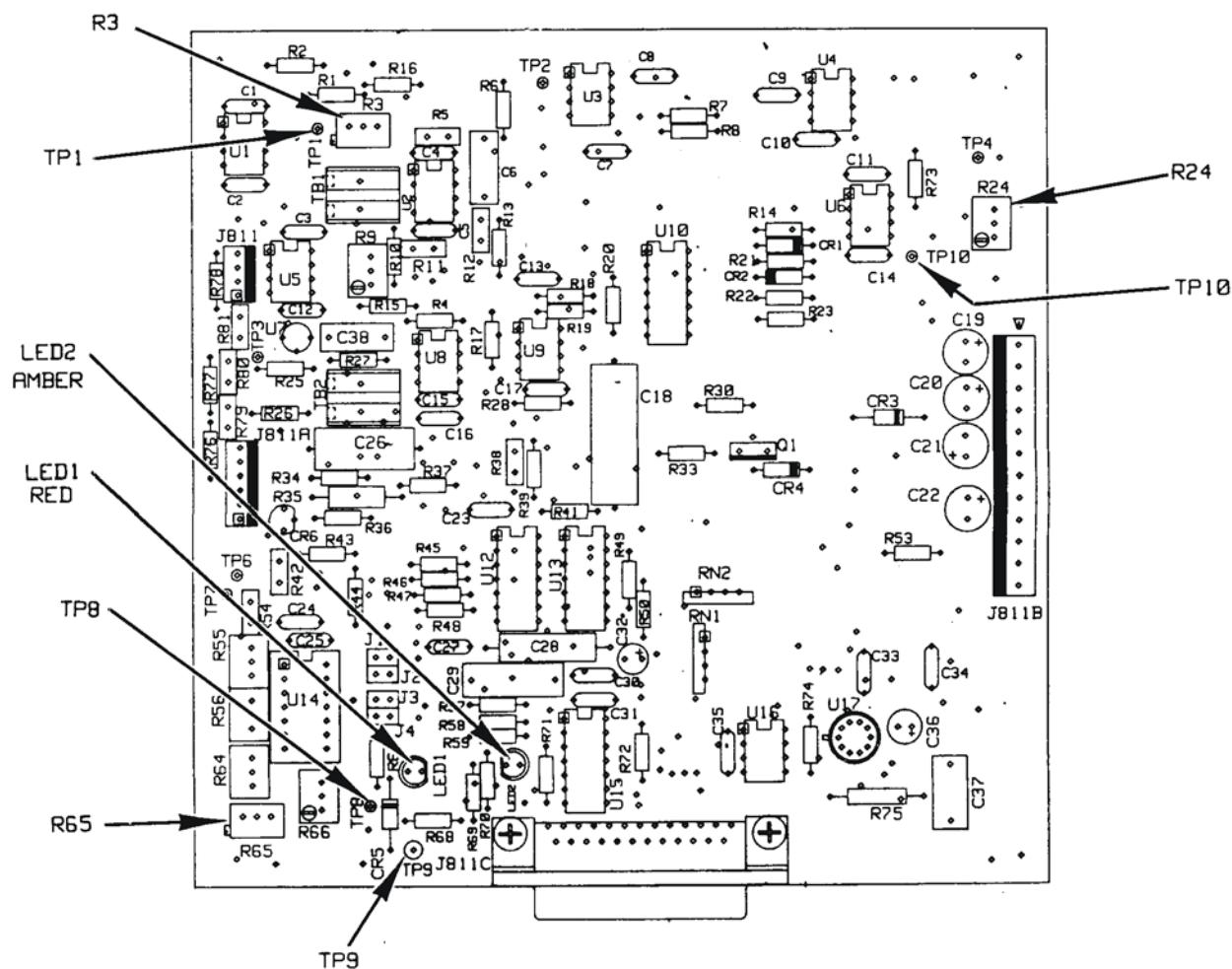


Figure 3-27
Furnace Control Card

Adjusting the Timer Valve

H\Y\hja Yf\j U\j Y\]g\`cW\hYX\cb\h\Y\`Y\h\g]XY\cZ\h\Y\cl m[Yb\Z fbUW\UbX\k Ug\dfcdYf\m UX\`ghYX\Xi f\b[\h\Y\`a Ubi ZUW\`f\b[\`dfcW\gg\`=Z\h\Y\hja Yf\j U\j Y\`k Ug\`gYf\j]W\X\`cf\fYd\`UW\X\`UX\`gha Ybh\`a Um\`VY\`bYW\ggUfm\`



To prevent serious injury or equipment damage, turn the AC power Off to the furnace and disconnect it from facility power before removing the left side panel.

- %" FYa cj Y\h\Y\`Y\h\g]XY\`dUbY\`cZ\h\Y\`*&, `C\`A cXi\`Y"
- &" @ccgYb\h\Y\`cW\`bi h\`UbX\`dcg\`h\`cb\`h\`bYUf\h\Y\`YUX\`f\`Mch\`ca \`cZ\h\Y\`j U\j Y\`UX\`gha Ybh\`gW\`Yk\`"
- ' " Hi fb\h\Y\`j U\j Y\`UX\`gha Ybh\`gW\`Yk\` i\`bh\`h\Y\`d\`i b\`[Yf\`c\`f\b[\`g\`Uh\`h\Y\`g\`Ua Y\`Y\`[\`h\`Ug\`h\Y\`h\`cd\`j U\j Y\`a ci\`bh\`b\`[gW\`Yk\`FY\`Z\`f\`h\` :][i\`fY\` !&, \`Z\`c\`ck\`b\`[\`h\`g\`ci\`X\`VY\`h\`[\`h\`Yb\`YX\`i\`bh\`h\`g\`gbi\`[U\`U\`bg\`h\`h\`Y\`Vch\`ca\`cZ\h\Y\`j U\j Y\`ci\`g\`b\`[\`8\`c\`bch\`cj\`Yf\`h\`[\`h\`Yb\`j\`h\`"
- (" Hi fb\h\Y\`cW\`b\`[bi h\`UbX\`dcg\`h\`cb\`h\`Ug\`g\`ck\`b\`[b\` :][i\`fY\` !&, \`Z\`c\`ck\`b\`[\`h\`g\`ci\`X\`VY\`h\`[\`h\`Yb\`YX\`i\`bh\`h\`g\`gbi\`[U\`U\`bg\`h\`h\`Y\`Vch\`ca\`cZ\h\Y\`j U\j Y\`ci\`g\`b\`[\`8\`c\`bch\`cj\`Yf\`h\`[\`h\`Yb\`j\`h\`"
-) " FY\`bg\`h\`U\`h\Y\`Y\h\g]XY\`dUbY\`"

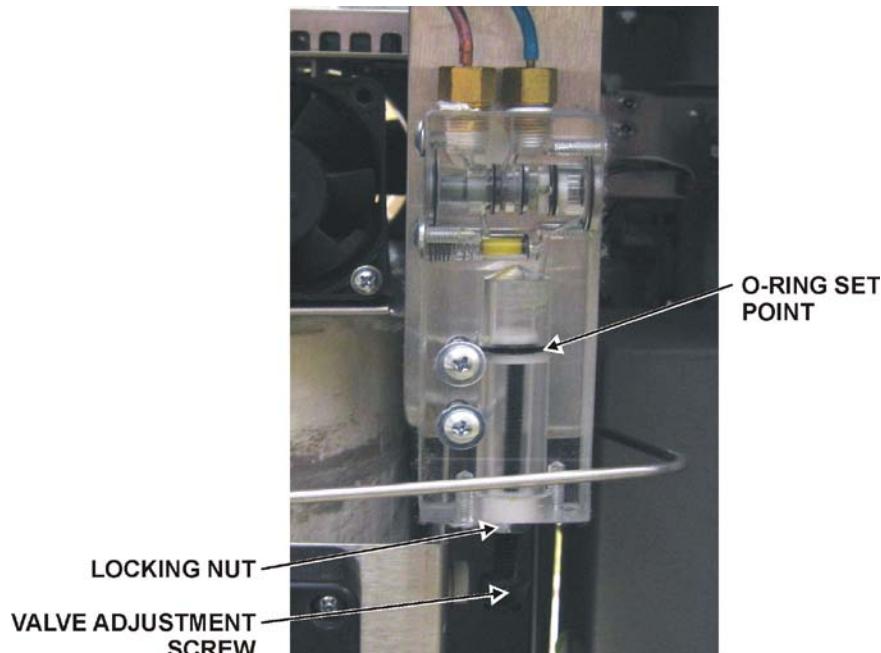
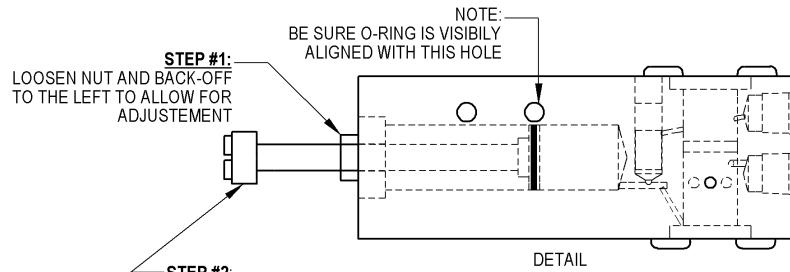
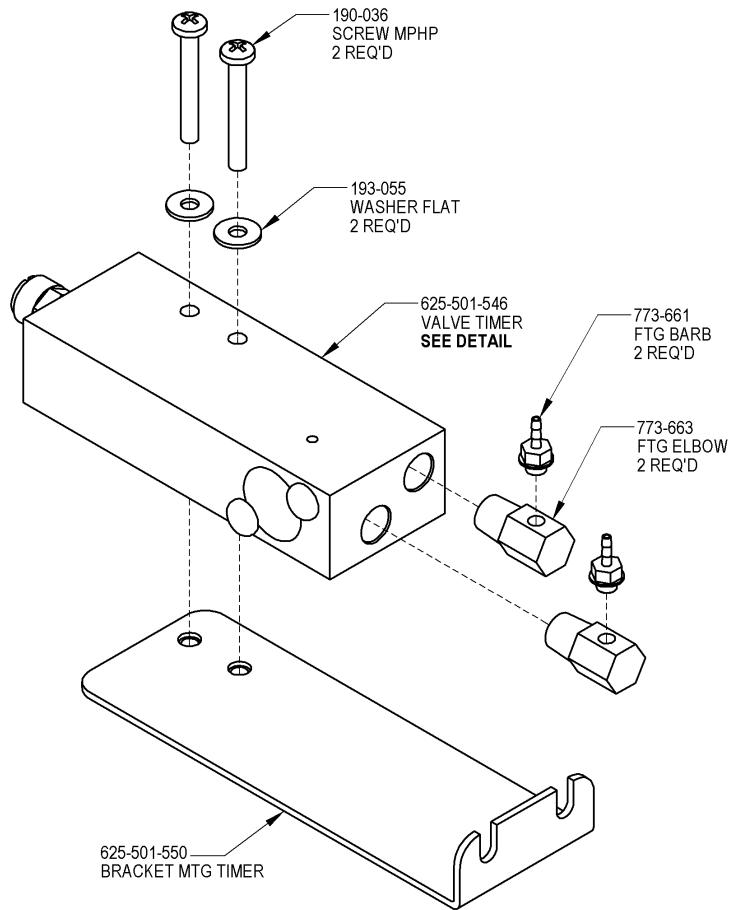


Figure 3-28
Timer Valve Adjustment

Illustrations, 628 O Module

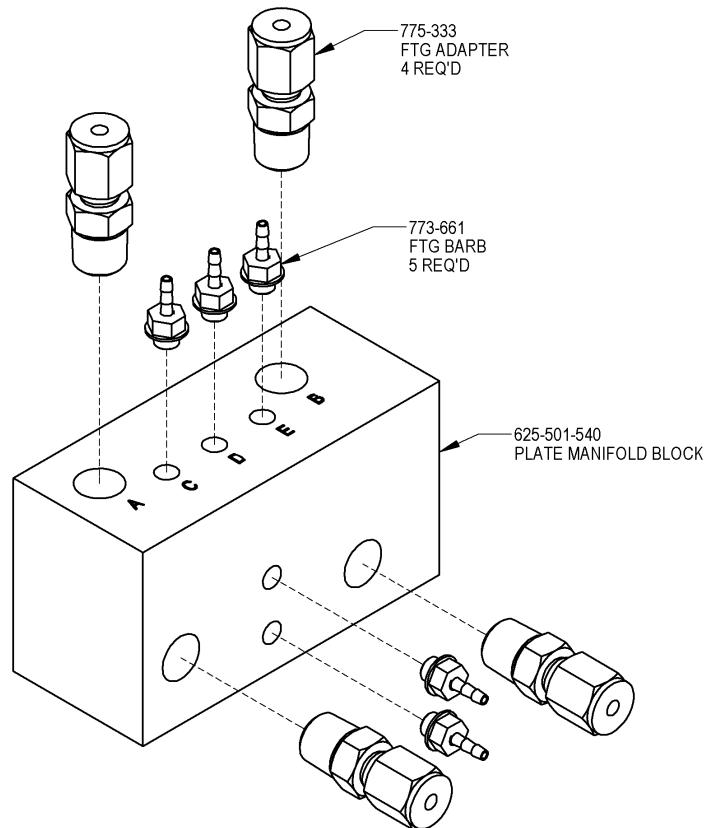


STEP #2: HAND ADJ. SCREW INTO VALVE TO SET O-RING EVEN WITH SECOND MTG. HOLE. THEN RE-TIGHTEN LOCK NUT TO VALVE BODY TO HOLD POSITION. **NOTE:** IF O-RING IS TO THE RIGHT OF THIS HOLE, THE INPUT OF AIR PRESSURE IS REQ'D TO SEND PISTON BACK TO THE LEFT, PISTON IS NOT ATTACHED TO SCREW.



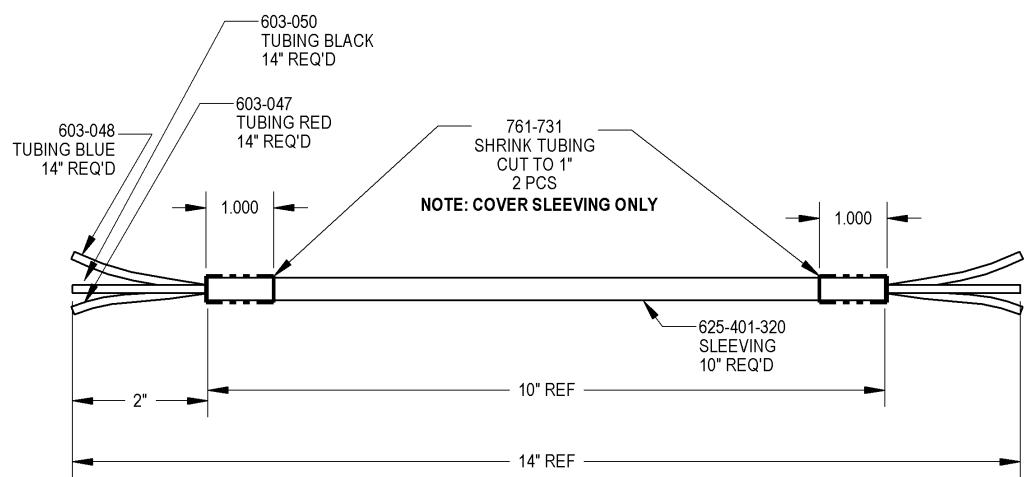
ILS-00524-D

Figure 3-29
Timer Valve Assembly



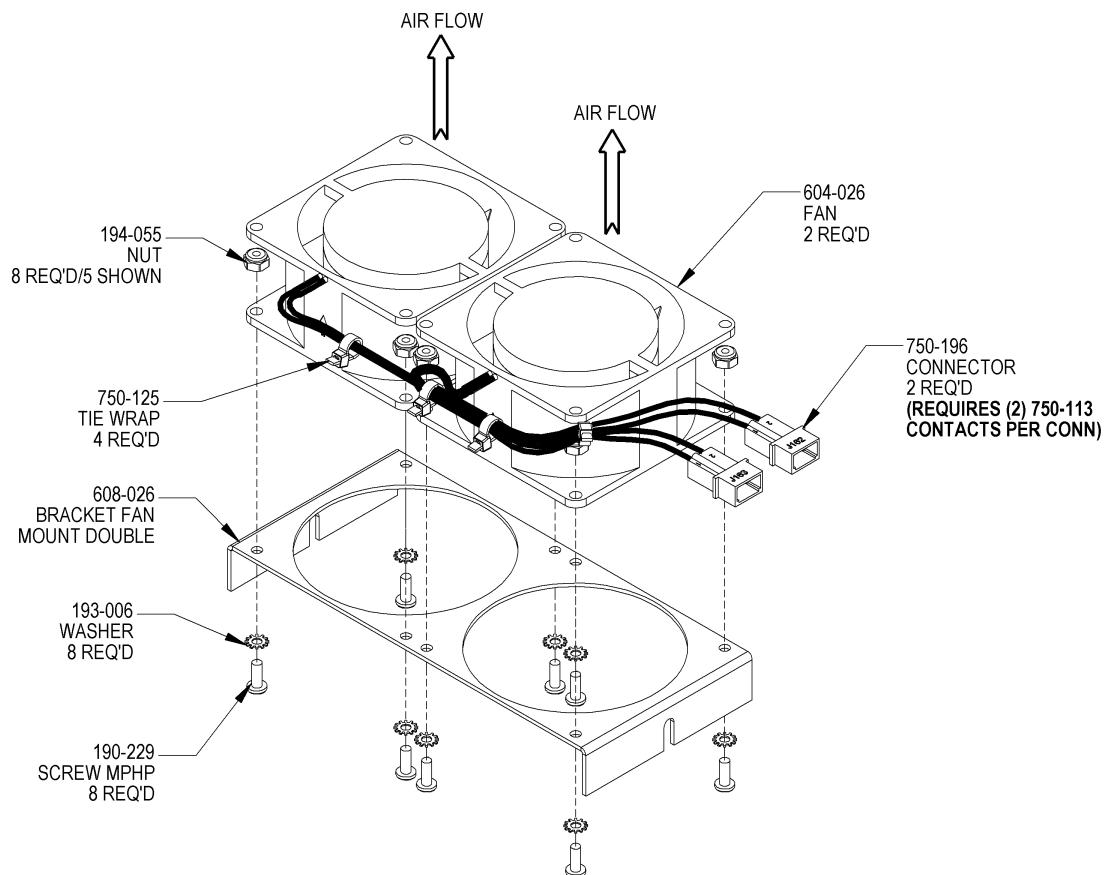
ILS-00526-A

**Figure 3-30
Manifold Assembly**



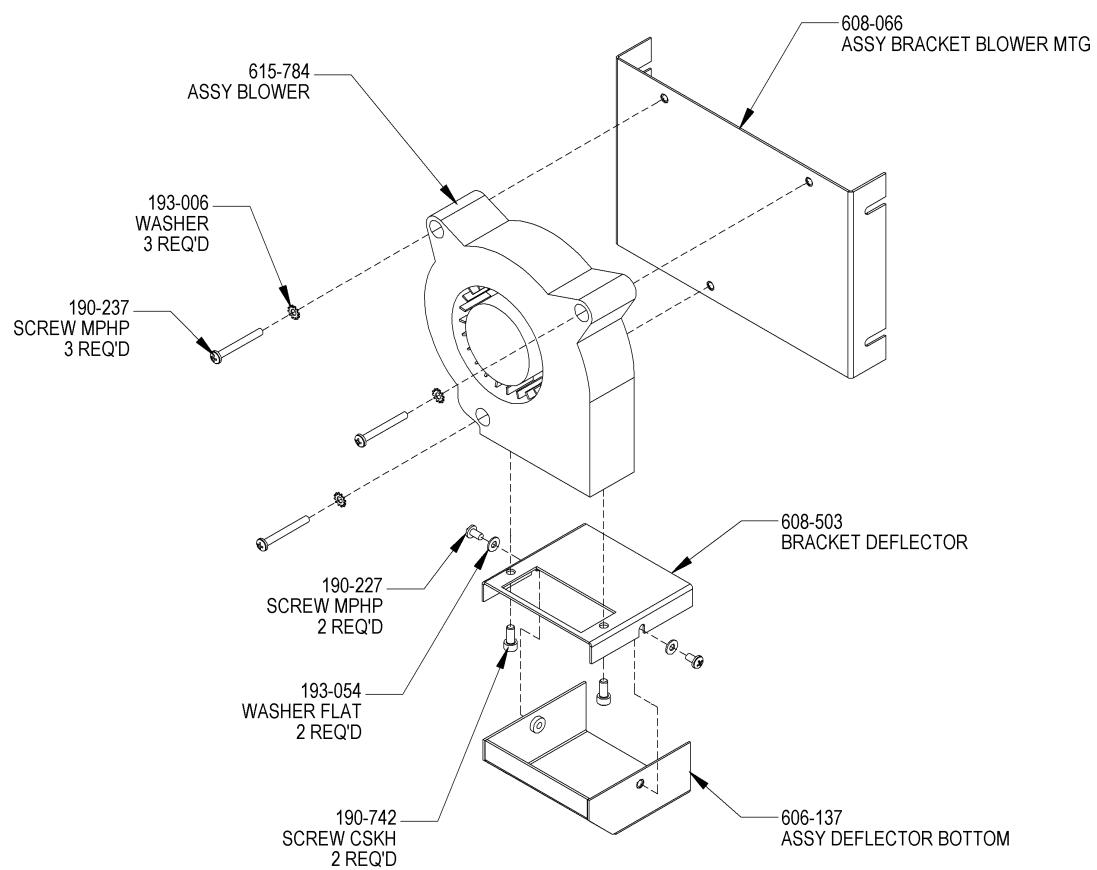
ILS-00527-A

Figure 3-31
Pneumatic Line Assembly



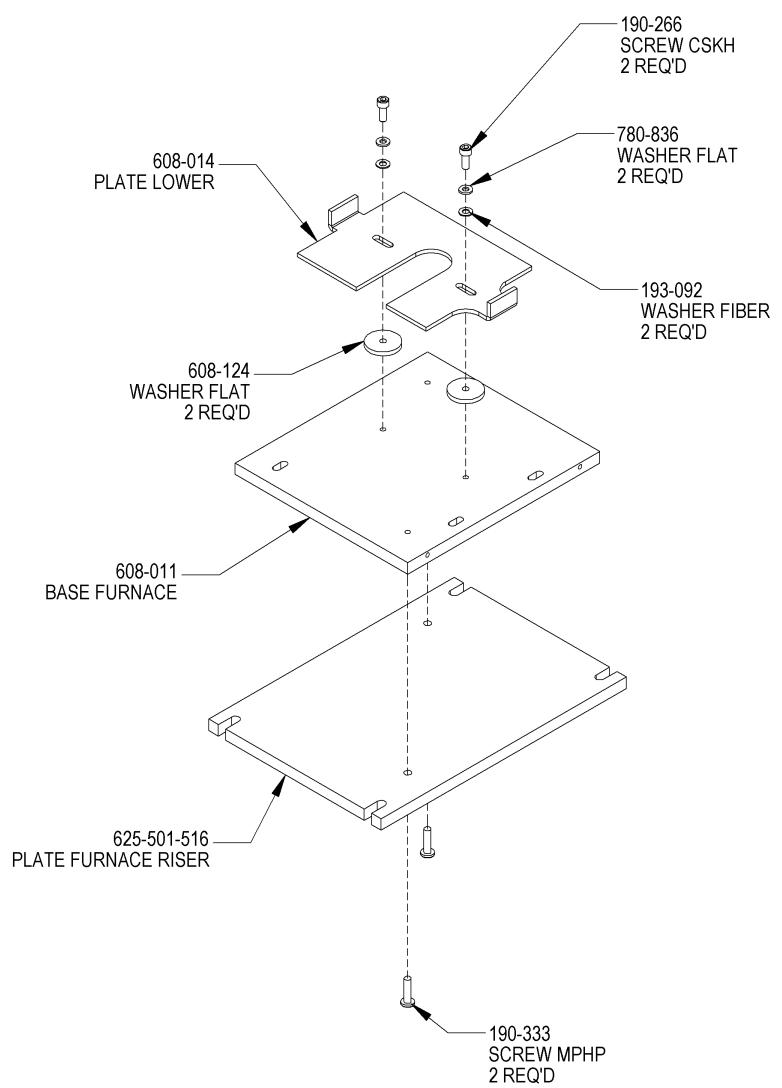
625-501-555 - J
SHEET 1 OF 9

Figure 3-32
Furnace Assembly Sheet 1 of 9



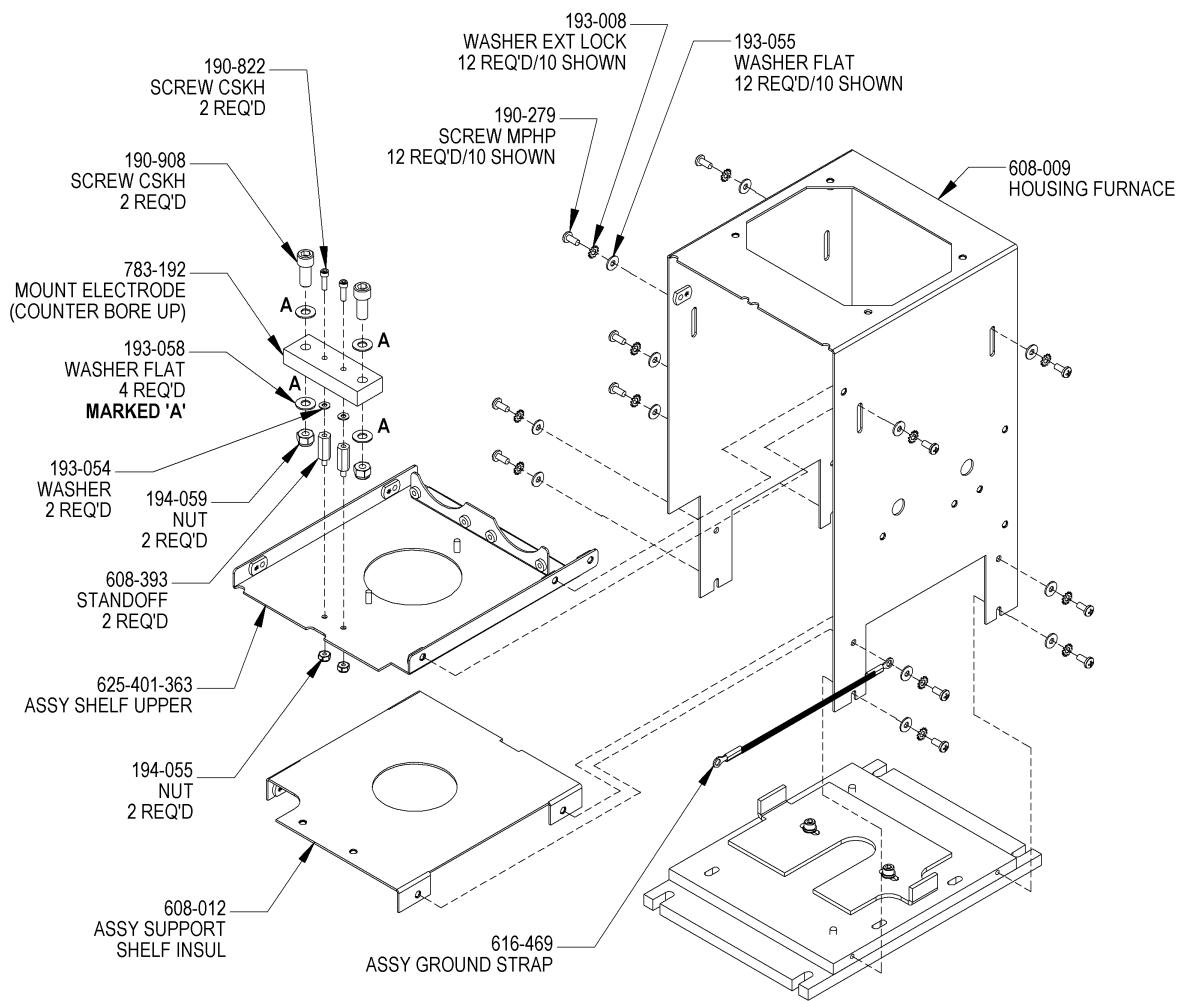
625-501-555 - J
SHEET 2 OF 9

Figure 3-33
Furnace Assembly Sheet 2 of 9



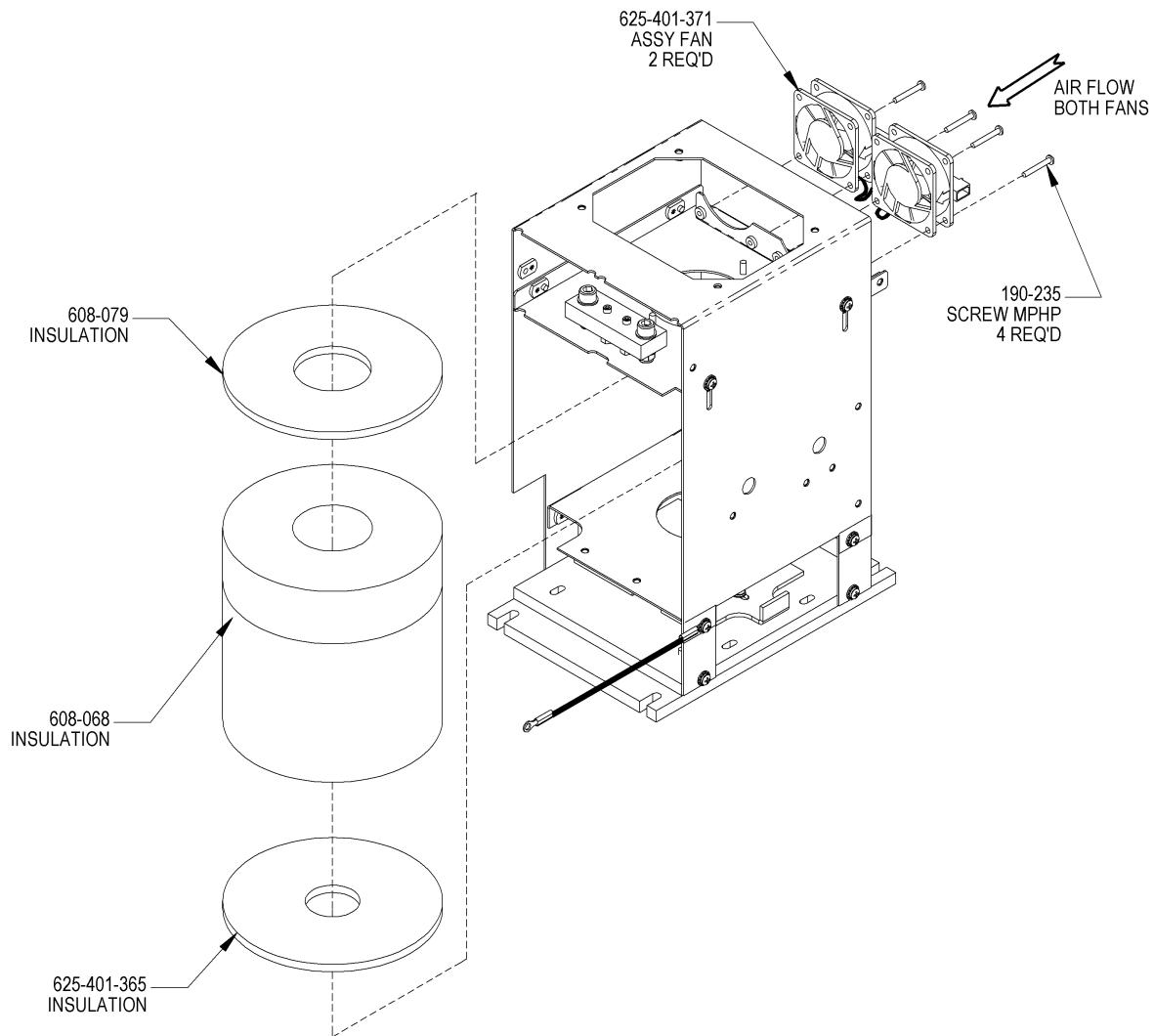
625-501-555 - J
SHEET 3 OF 9

Figure 3-34
Furnace Assembly Sheet 3 of 9



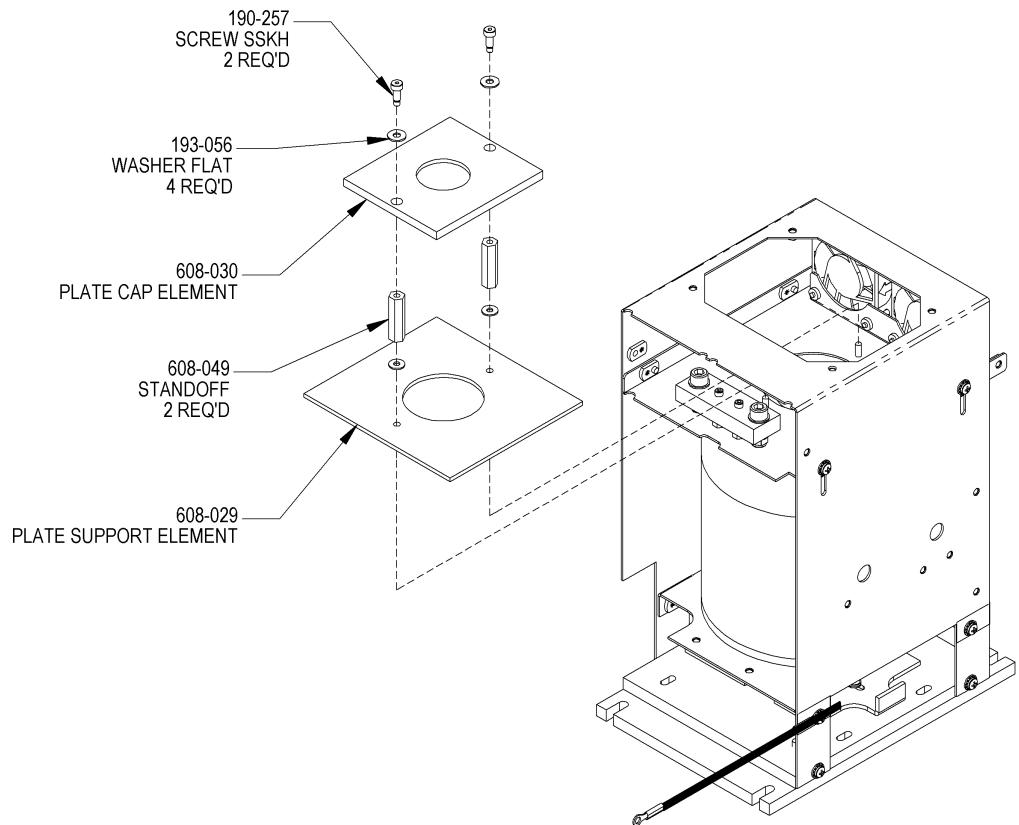
625-501-555 - J
SHEET 4 OF 9

Figure 3-35
Furnace Assembly Sheet 4 of 9



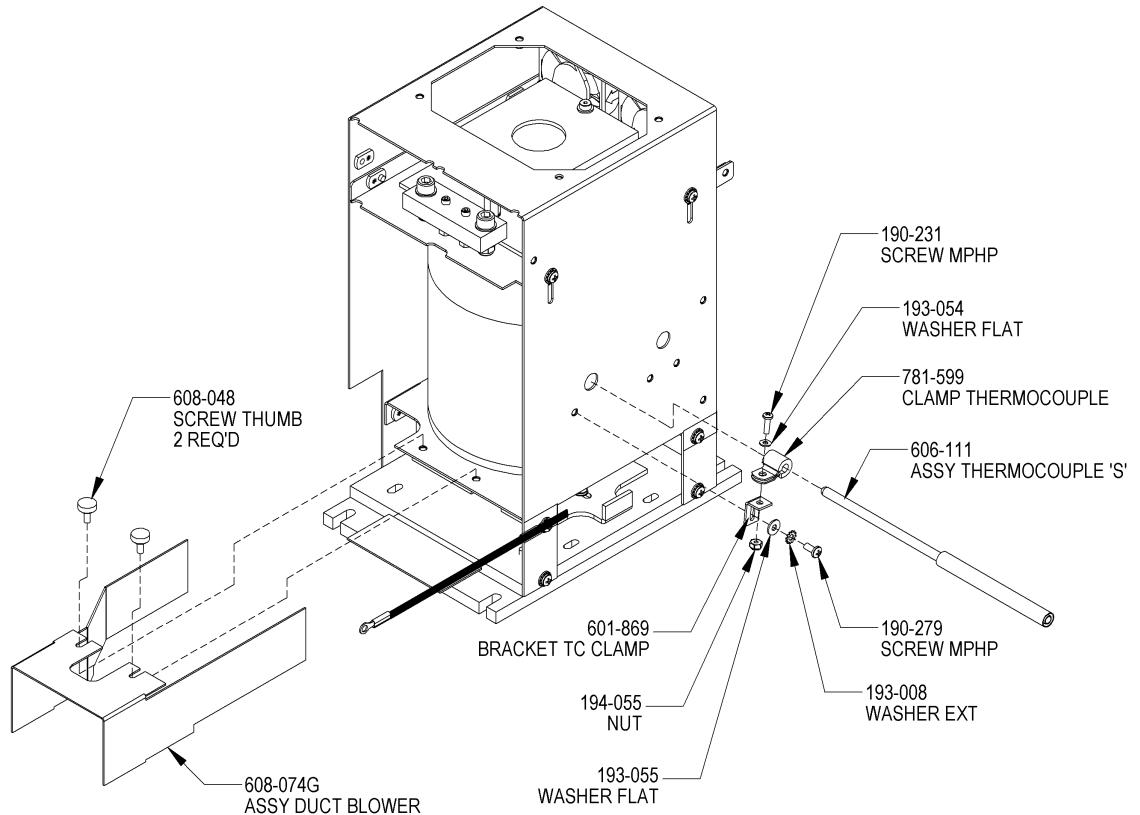
625-501-555 - J
SHEET 5 OF 9

Figure 3-36
Furnace Assembly Sheet 5 of 9



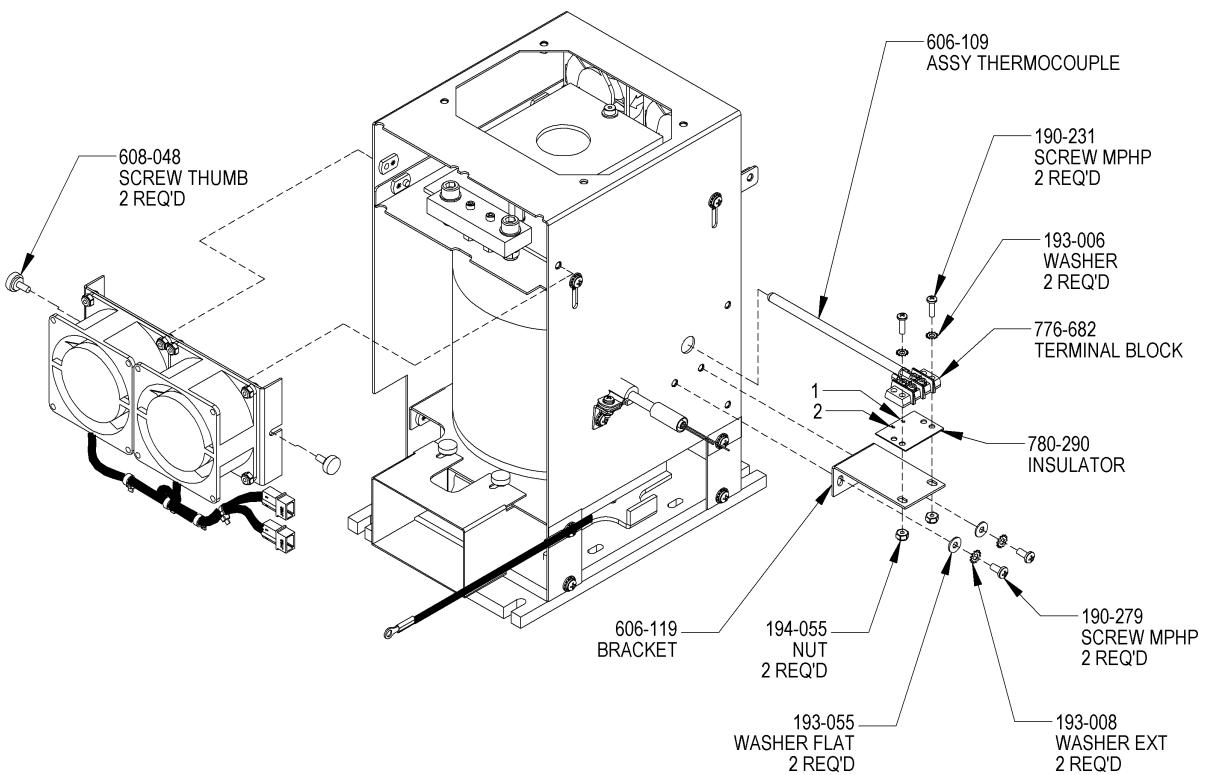
625-501-555 - J
SHEET 6 OF 9

Figure 3-37
Furnace Assembly Sheet 6 of 9



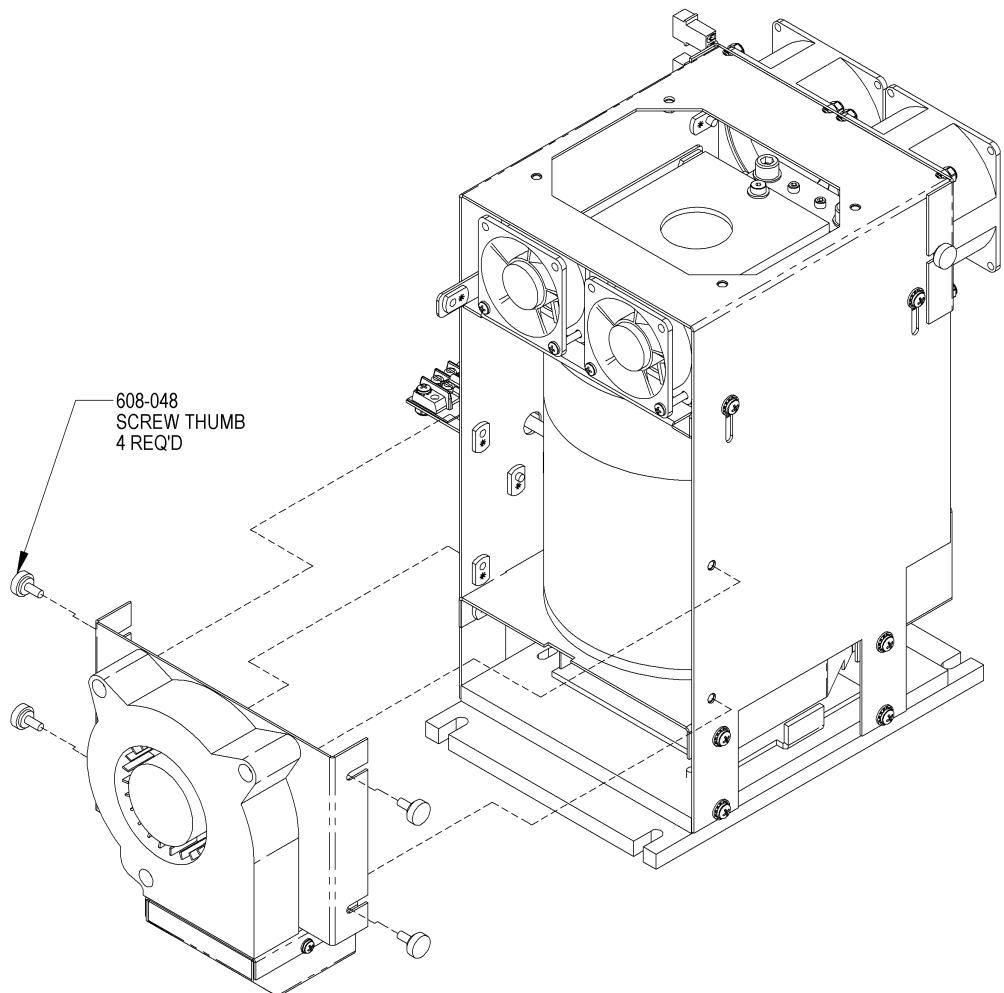
625-501-555 - J
SHEET 7 OF 9

Figure 3-38
Furnace Assembly Sheet 7 of 9



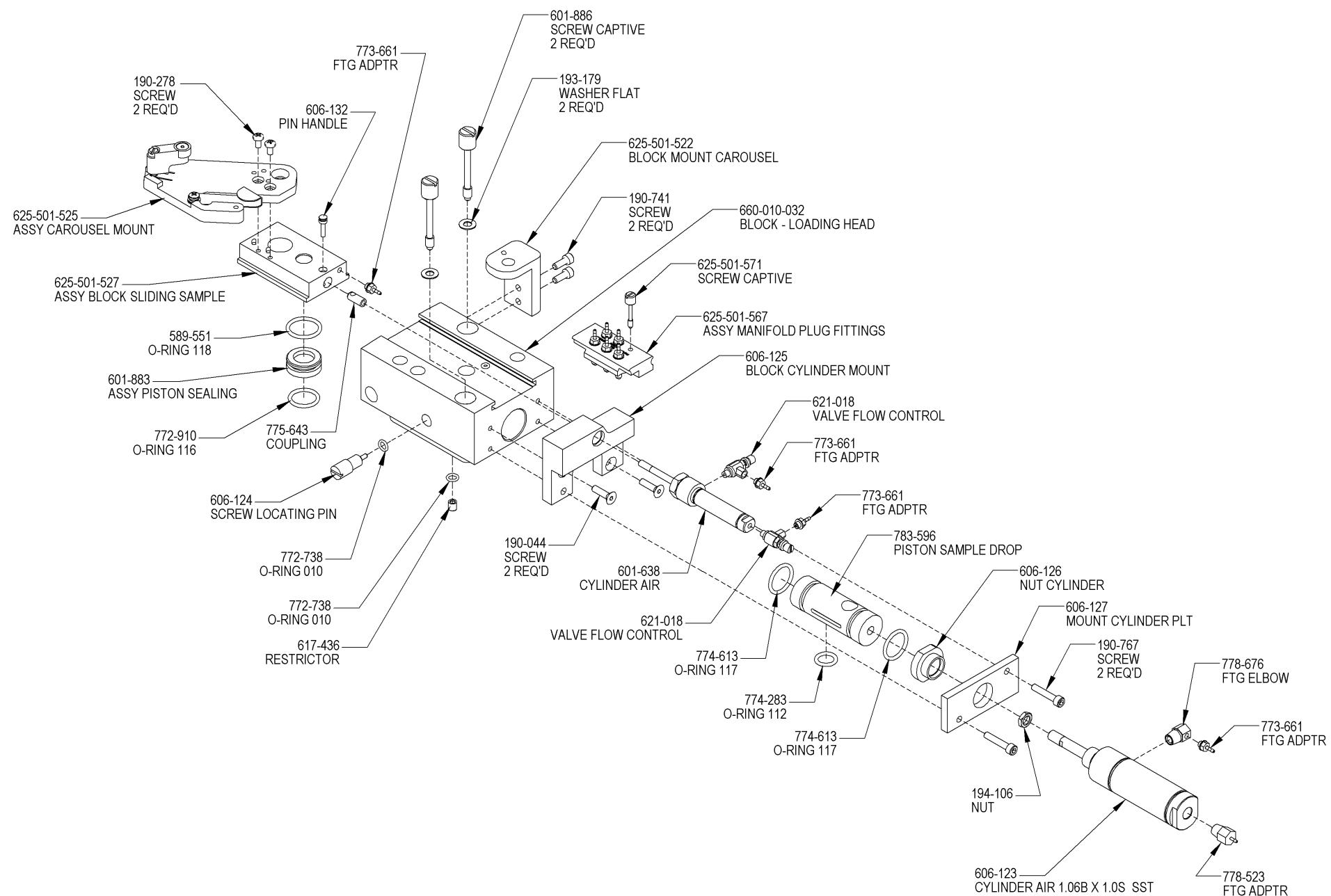
625-501-555 - J
SHEET 8 OF 9

Figure 3-39
Furnace Assembly Sheet 8 of 9



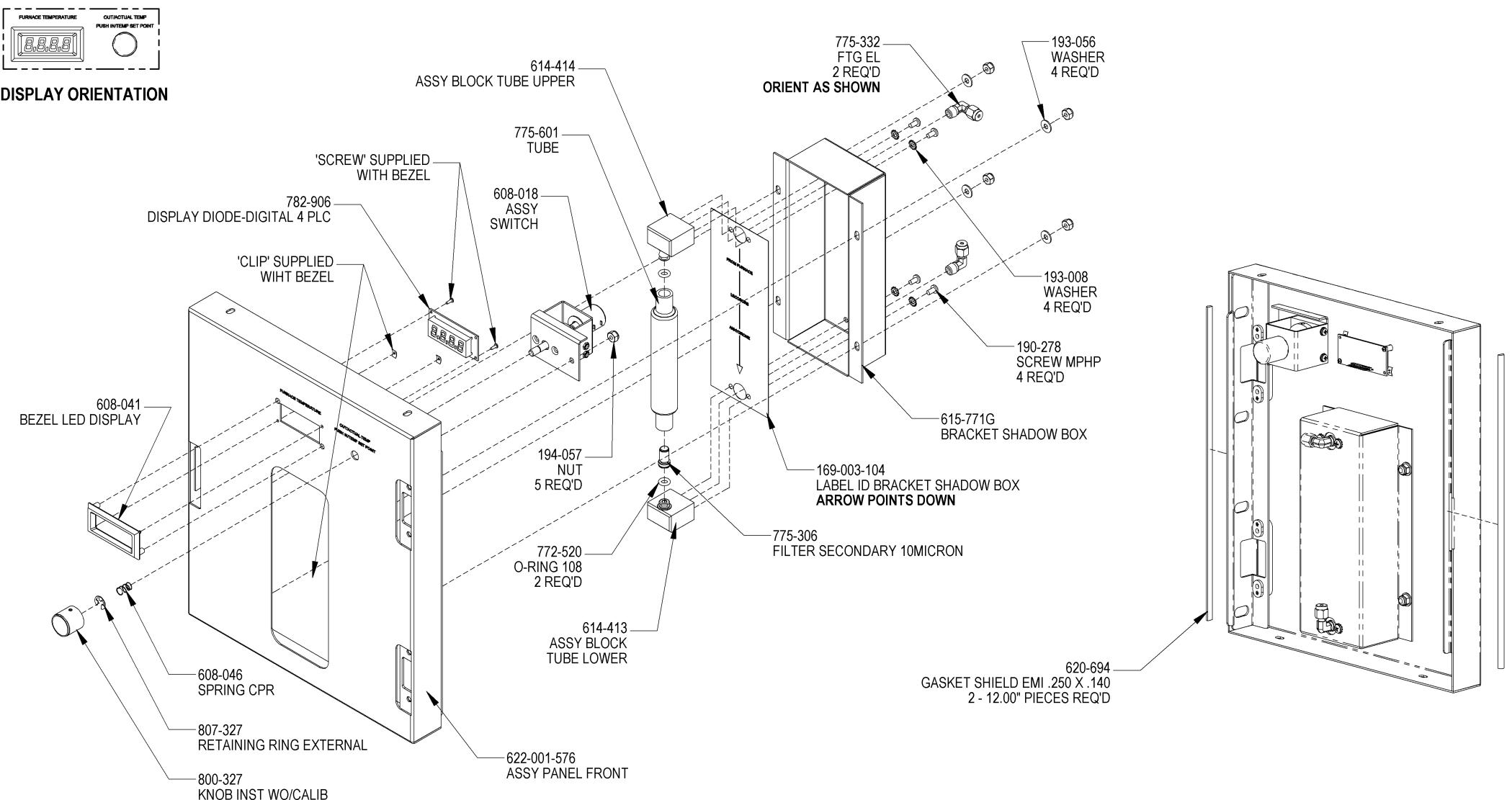
625-501-555 - J
SHEET 9 OF 9

Figure 3-40
Furnace Assembly Sheet 9 of 9

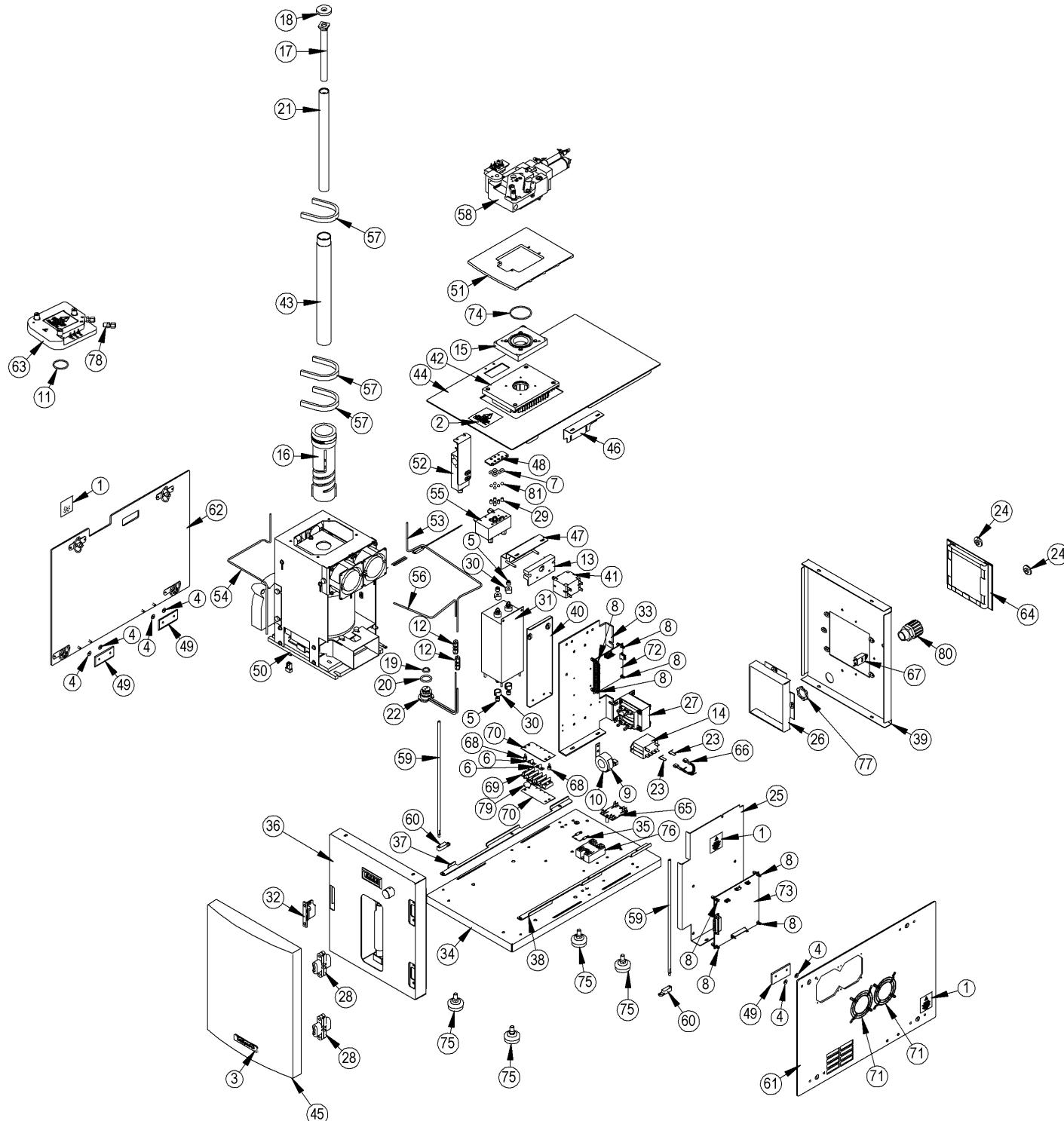


ILS-00523-E

Figure 3-41
Loading Head Assembly



622-001-580-ILS-A



ILS-00528-M

X = ASSY CARD REVISION AS INDICATED BY WORK ORDER OR KIT COMPONENT

Figure 3-43
Oxygen Furnace Exploded View

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	169-001-731	LABEL WARNING CE HI VOLTAGE	3
2	169-002-789	LABEL CAUTION REMOVE PRESSURE	1
3	169-003-102	LABEL ID TRUSPEC O	1
4	193-055	WASHER FLT .170X .437X.04STZP	6
5	194-116	NUT RND K 8-32X .28 NY	4
6	540-132	Strap-Connector Jumper Terminal Block	2
7	601-505	O-RING 201 .171X .449X.139S	5
8	602-581	STANOFF PC CARD .290	8
9	602-698	BRACKET C CURRENT XFORMER RCG	1
10	602-699	ASSY TRANSFORMER CURRENT 100:1	1
11	602-803	O-RING 125 1.299X 1.505X.103S	1
12	604-399	FTG UNION BR .12T - .12T	2
13	606-585	Mount Breaker Circuit Molded	1
14	607-157	RELAY DPST 24V	1
15	608-028	PLATE SAMPLE DROP	1
16	608-052	ELEMENT HEATING 7.75X3.00X2.12	1
17	608-065	LANCE GRAPHITE	1
18	608-087	WASHER FLT .307X1.455X.25CER	1
19	608-089	O-RING 113 .549X .755X.103A	1
20	608-090	O-RING 212 .859X 1.125X.139A	1
21	608-130	TUBE QUICK DISC .950DX11.65GR	1
22	608-133	ASSY FITTING TUBE LOWER	1
23	610-150	TERMINAL LUG ADAPTER	2
24	614-695	TAB LOCKING	2
25	615-770	BRACKET CONTROL CARD	1
26	615-774	ASSY GUARD FILTER	1
27	615-785	Assy Transformer	1
28	615-958	Hinge Concealed Door Chrome	2
29	617-212	SPRING COMPRESSION GROUND ENDS	5
30	617-457	CAP INSUL POST .68 DIA X .40	4
31	617-458	LINE FILTER 45 AMP	1
32	617-713	CATCH ASSY DOOR NON-MAGNETIC	1
33	618-561	ASSY PANEL DIVIDER	1
34	618-565G	ASSY BASE VTF	1
35	619-580-105	ASSY RESISTOR FOR 781-165 RELAY	1
36	622-001-580	ASSY PANEL FRONT COMPLETE	1
37	622-001-581	ANGLE GASKET MTG L SIDE	1
38	622-001-582	ANGLE GASKET MTG R SIDE	1
39	622-001-591	ASSY PANEL BACK	1
40	622-001-611	ASSY BRACKET LINE FILTER	1
41	625-336	CIRCUIT BRK 25 A 250V DPST PO	1
42	625-401-369	PLATE TOP FURNACE	1
43	625-401-360	TUBE MULLITE, MACHINED	1
44	625-501-506	ASSY WIRE SHELF	1
45	625-501-509G	DOOR - MACHINED	1
46	625-501-528	BRACKET PANEL DIVIDER	1
47	625-501-530	ASSY BRACKET CIRCUIT BREAKER	1
48	625-501-543	PLATE MANIFOLD BLOCK	1
49	625-501-548	PLATE GUIDE PANEL SIDE	3
50	625-501-555	ASSY FURNACE	1
51	625-501-557	BASE - MOUNT LOADING HEAD	1
52	625-501-560	ASSY VALVE TIMER	1
53	625-501-561	TUBE MANIFOLD TO COMB LOW	1
54	625-501-562	TUBE REAGENT BTM TO MANIFOLD	1
55	625-501-566	ASSY MANIFOLD CHECK/V FITTINGS	1
56	625-501-569	TUBE REAGENT TOP/ADPTR LOWER	1
57	625-505-643	INSULATION HEATING ELEMENT	3
58	660-010-031	ASSY LOADING HEAD	1
59	660-010-124	ROD SUPPORT	2
60	660-010-125	BLOCK SUPPORT	2
61	660-010-126G	ASSY RIGHT PANEL	1
62	660-010-127G	ASSY PANEL LEFT	1
63	660-010-141	ASSY BLOCK INTERFACE MICRO DEDICATED	1
64	660-010-160	ASSY FRAME AND FILTER	1
65	666-037	ASSY CARD SSR PHASE CONTROLLER	1
66	701-899	Assy Dio IN4004 W/ 250 Spade	1
67	702-622	CIRCUIT BRK .5A 250V SPST PO	1
68	767-571	Support Circuit Board	2
69	770-990	TERMINAL BLOCK 4POS .50 X 2.81	1
70	770-991	PLATE DESIGNATION MARKER STRIP 4 PLC	2
71	772-993	GUARD FAN	2
72	777-810X	ASSY CARD MULTI OUTPUT DC SUP	1
73	777-811X	ASSY CARD FURNACE CONTROL	1
74	779-513	O-RING 135 1.925X 2.131X.103V	1
75	780-970	FOOT LEVELING 375.16X .625	4
76	781-165	RELAY SOLID STATE 50A	1
77	781-973	FITTING NUT CONDUIT .75-14	1
78	782-502	FTG ADPTR SS .12T-.12MPT	1
79	783-199	Assy Varistor with Lugs	1
80	803-898	FTGE ADPTR STG .75C .50/.62NY	1
81	805-079	BALL BEARING	5

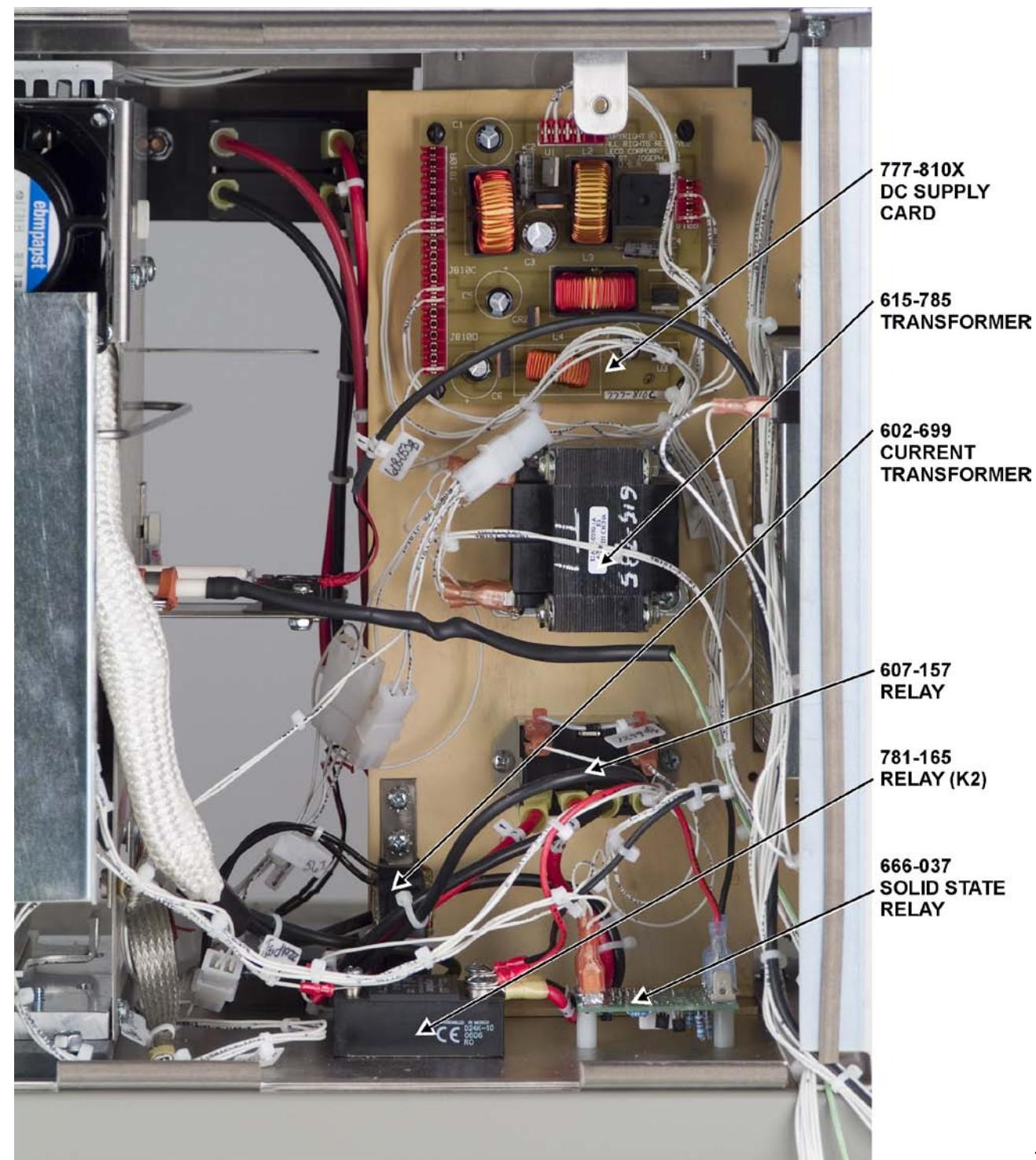


Figure 3-44
Right Side View – Divider Panel Removed

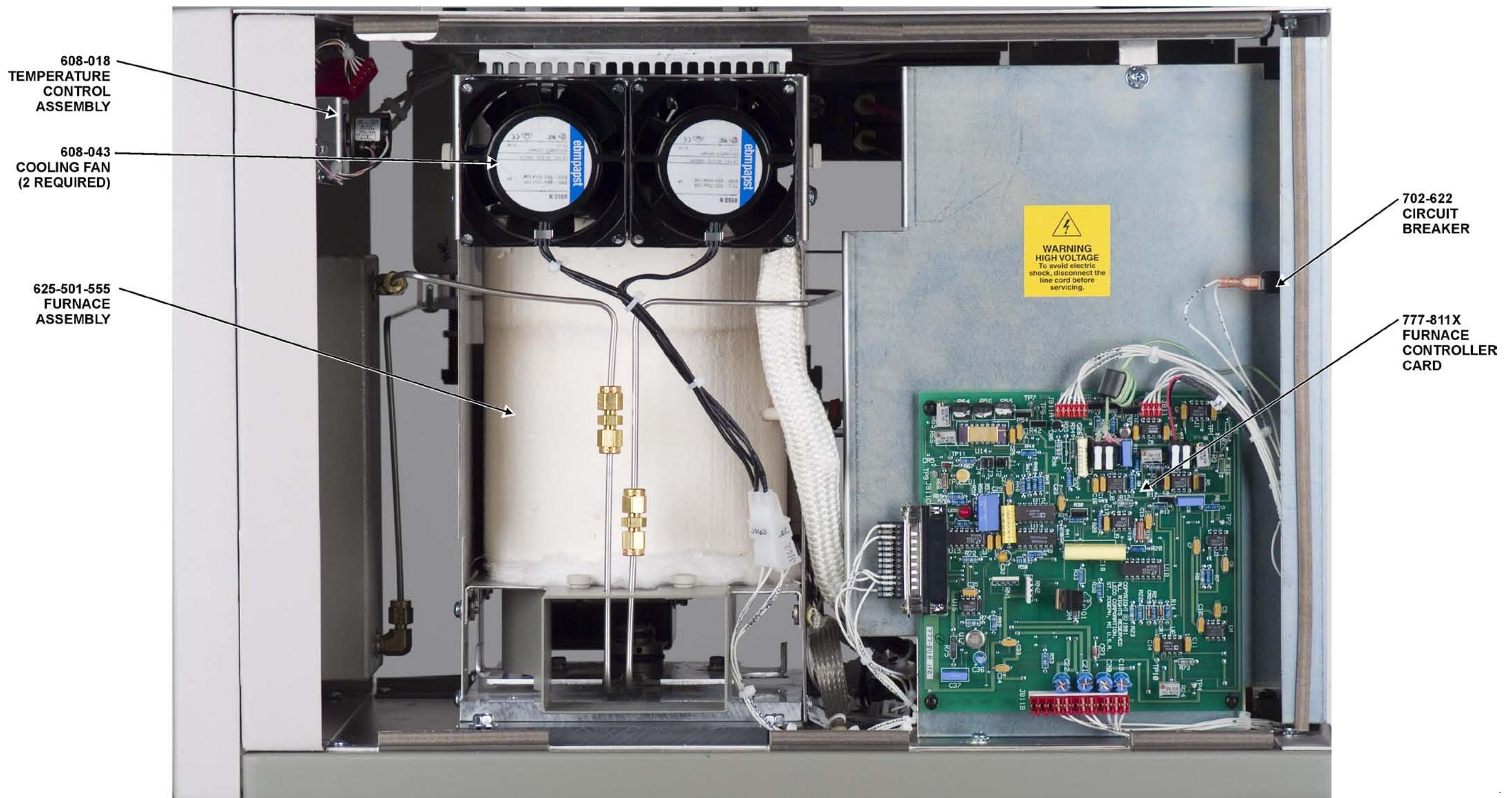


Figure 3-45
Right Side View

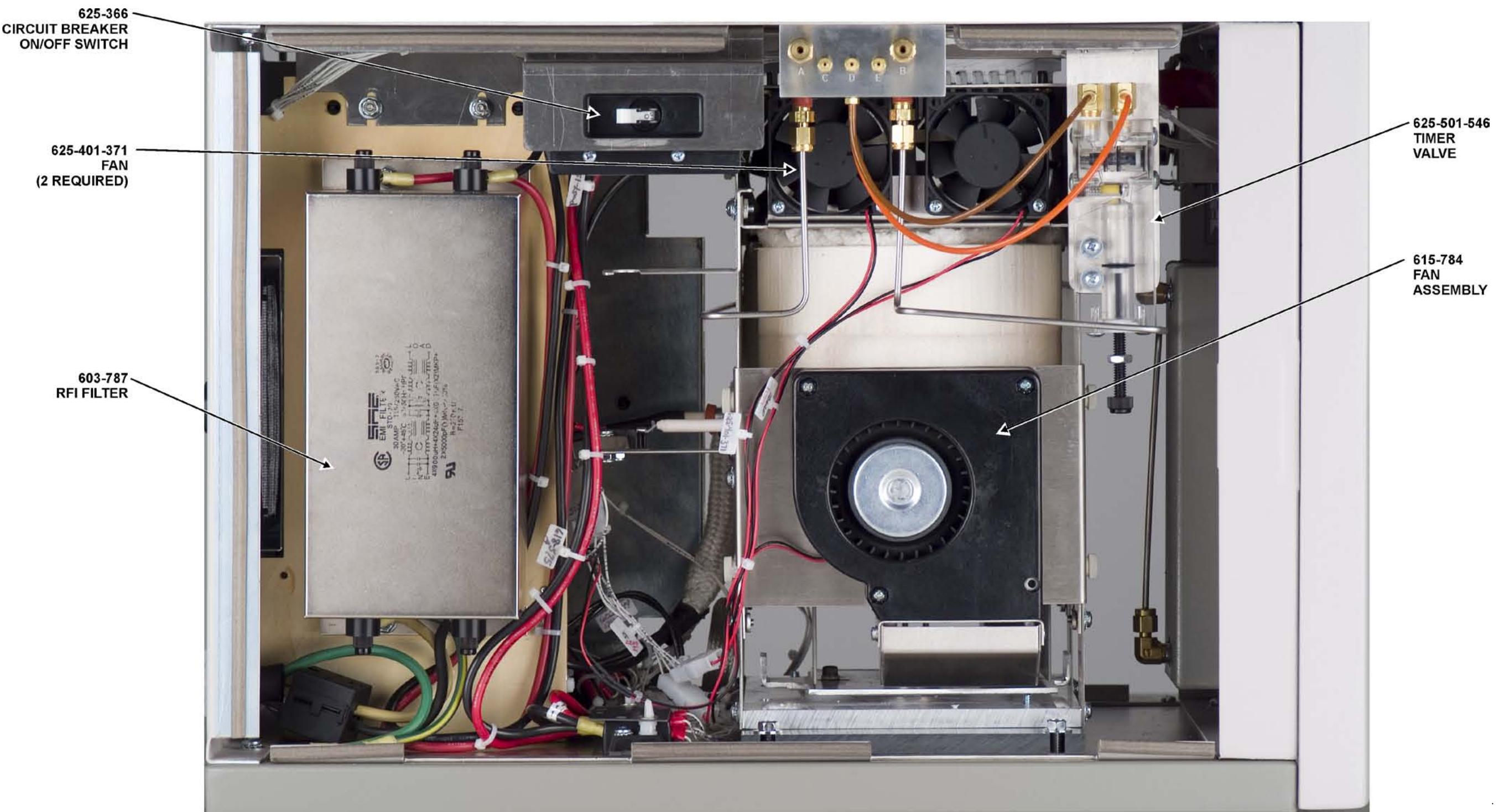


Figure 3-46
Left Side View

4 System Setup

H\Y`GmghYa `GYhi d`WUdhyf`YI d`U]bg`\ck `hc`gYh`h\Y`cdYfUh]b[`dUfUa YhYfg`Zcf`U`
gdYV]WUdd`]WU]cb`cf`gYh`c`Udd`]WU]cbg``H\YgY`dfcW]Xi fYg`g\ci `X`VY`XcbY`VYzcfY`
UbmgUa d`Yg`UfY`UbU`mnYX`Zcf`h\Y`Zfgh`h]a Y`dYf`Udd`]WU]cb`"

NOTE → H\Y`bi a VYfg`i gYX`Zcf`h\Y`gWYYb`g\ch`YI Ua d`Yg`]b`h\]g`a Ubi U`UfY`cb`mhc`]`i ghfUhY`
cdYfUh]cb`UbX`a Umfcf`a Umbch`VY`Udd`]WU]Y`hc`gdYV]WdfcW]Xi fYg`"

=`i ghfUh]cbg` (E)

: fcbh`DUbY`7cbhfc`g`UbX`i bW]cbg` (E+)

A Ybi `Cj Yfj]Yk` (E,

8UhJVUgY`A Ybi` (E,

9X]h`A Ybi` (E,

J]Yk` A Ybi` (E-

GUa d`Yg`A Ybi` (E%\$

7cbZ[i fUh]cb`A Ybi` (E%&

8]U[bcgh]Wg`A Ybi` (E%<

A U]bh`bUbW`A Ybi` (E%(

5dd`m]b[`Dck Yf` (E%)

GY`YV]b[`U`@Ub[i U[Y` (E%*

8YhYfa`]b]b[`I gYf`DYfa`]gg]cbg` (E%+

5XX]b[`I gYf`]b`Windows`CG` (E%+

5XX]b[`I gYfg`hc`=bghfi`a Ybh`GcZh`k UfY` (E%+

7\Ub[]b[`I gYfg`]b`Windows`CG` (E%

8Y`Yh]b[`I gYfg`]b`h\Y`=bghfi`a Ybh`GcZh`k UfY` (E%

5XX]b[`cf`7\Ub[]b[`I gYf`DYfa`]gg]cb`Zcf`=bghfi`a Ybh` (E%-

8]gd`Um`7cbZ[i fUh]cb` (E&%

A U]b`GwYYb`Cj Yfj`]Yk` (E&%

7cbZ[i f]b[`:]Y`Xg` (E&&

7cbZ[i f]b[`: cbh` (E&`

7fYUh]b['U'8Ug\ VcUfX'DUbY'.....(È&(

G]b['Y'GUa d'Y'GY'YWYX'.....(È&)

G\ck]b['Ub '9'Ya Ybh'D'ch]b 'h Y'8Ug\ VcUfX'.....(È&)

G\ck]b['9'Ya YbhJ U'i Yg]b 'h Y'8Ug\ VcUfX'.....(È&*

8Ug\ VcUfX'HUV'@UVY'.....(È&*

A i 'hjd'Y'GUa d'Yg'GY'YWYX'.....(È&+

7cbZ][i f]b['h Y'8Ug\ VcUfX'.....(È&,

Dcg]h]cb 'U'8Ug\ VcUfX'.....(È&,

GWYYb '@Umci hg'.....(È&-

<]XY#G\ck 'h Y'Hcc'VUf'.....(È&-

<]XY#G\ck 'h Y'GHJh g'6Uf'.....(È' \$

@c['6Uf'.....(È' \$

G\cfhW/hg'h'A cj Y'6Yh Yb'GUa d'Yg'.....(È' \$

; c'h':]fgh'Fck 'jb 'h Y'GdfYUXg\ YYh'.....(È' \$

; c'h:@Ugh'Fck 'jb 'h Y'GdfYUXg\ YYh'.....(È' \$

; c'h'5bU'mnY'Fck 'jb 'h Y'GdfYUXg\ YYh'.....(È' \$

5i h'K]Xh\g'.....(È' \$

GmghYa '7cbZ][i fUh]cb'.....(È' %

GmghYa '7cbZ][i fUh]cb '8YZ]b]h]cbg'.....(È' &

7U']VfUh]b['6Ufc a Yhf]WDfYggi fY'Zcf'H7 '7Y'.....(È' '

FYa chY'7ca a i b]WUh]cb'.....(È' (

FYa chY'GUa d'Y'@c[]b'.....(È' (

FYa chY'7cbhfc'.....(È')

8UHU'HfUbga]h'.....(È')

5bU'mn]g F Ygi 'hg'.....(È' *

9i Ua d'Yg'.....(È' *

5XX'U'gUa d'Y'.....(È' *

GHJfh'Ub 'UbU'mn]g'.....(È' *

FYhf]Yj Y'h Y'UbU'mn]g]g'fYgi 'hg'.....(È' *

8Y'YhY'fYgi 'hg'%%\$'XUmng'c'X'cf'c'XYf'.....(È' *

7cbZ][i fY'GmghYa 'Zcf'FYa chY'7ca a i b]WUh]cb'.....(È' +

LA@7ca a UbX'HUV'Y'.....(È' ,

A YggU[Yg'.....(È(%

7ca a UbX'9i Ua d'Yg'.....(È(&

8Y'YhY'fYgi 'hg'%%\$'XUmng'c'X'cf'c'XYf'.....(È('

7fYUh]b['UbX'A cX]Zn]b['U'A Yh\cX'.....(E((
7fYUh]b['U'A Yh\cX'.....(E((
A cX]Zn]b['U'A Yh\cX'.....(E(+
7`cb]b['U'A Yh\cX'.....(E(,
9l dcfh]b['U'A Yh\cX'.....(E(-
=a dcfh]b['U'A Yh\cX'.....(E) \$
8Y`Yh]b['U'A Yh\cX'.....(E) &
5bUmg]g DUfUa YhYf`8YZ]b]h]cbg'.....(E)'
9`Ya YbhDUfUa YhYf`8YZ]b]h]cbg'.....(E)'
6i fb `DfcZ]Y`8YZ]b]h]cbg'.....(E)(
GYh]b['h`Y`6i fb `DfcZ]Y'.....(E)(
8YZ]b]b['7U]VfUh]cb`GhUbXUfXg'.....(E))
@c[[]b[']b`i g]b['7U]VfUh]cb`FYZYfYbW`A UhYf]U'.....(E)*
GhUbXUfX`@c[]b`8YZ]b]h]cbg'.....(E)+
GUa d`Y`HYa d`UhYg'.....(E),
7fYUh]b['U`GUa d`Y`HYa d`UhY'.....(E),
8Y`Yh]b['U`GUa d`Y`HYa d`UhY'.....(E)-
9X]h]b['h`Y`GUa d`Y`HYa d`UhY`@gh'.....(E)-
@c[[]b[']b`i g]b['U`GUa d`Y`HYa d`UhY'.....(E*\$
GUa d`Y`:]hYfg'.....(E*%)
5dd`]b[mU`:]hYf`UbX`Gcfh]b['GUa d`Y`8UhU'.....(E*%)
8YZ]b]b['U`:]hYf`h`5dd`m'.....(E*&
5i hca Uh]W`mFYUdd`m]b['h`Y`GUa d`Y`:]hYf'.....(E*)
I gYf`8YZ]bYX`:]Y`Xg'.....(E*)(
Bi a VYf`:]cfa Uh]b[.....(E*)
: cfa Uh`9l Ua d`Yg'.....(E*)
: cfa i `Ug'.....(E**)
: cfa i `U`9l Ua d`Yg'.....(E**)

A UbU[]b['8 UHUVUgYg" (E* +
I g]b['h Y'GHf h 8]U'c['6cl " (E*,
7fYUh]b['UbX'FYhf]Yj]b['8 UHUVUgY' 6UW_i dg" (E* -
7fYUH' 6UW_i d" (E* -
FYhf]Yj Y' 6UW_i d" (E* -
GY'YWh]b['U' 8 UHUVUgY' 7cbbYWh]cb" (E+\$
5XX]b['U' 8 UHUVUgY' 7cbbYWh]cb" (E+%

5XX]b['U' 7cbbYWh]cb'hc'Ub'9I]gh]b['8 UHUVUgY" (E+%

5XX]b['U' 7cbbYWh]cb'hc'U'BYk' 8 UHUVUgY" (E+&
8Y'Yh]b['U' 8 UHUVUgY' 7cbbYWh]cb" (E+(
J U']XUh]b['U' 8 UHUVUgY" (E+(
FYj]Yk]b['Cfd\Ub'CV\YWh" (E+)
7ca dUWh]b[#FYdU]f]b['U'@Y[UWh 8 UHUVUgY" (E+*
A UbU[]b['8 UHUVUgYg' Zcf'&% 7: F'DUfh'%% 7 ca d']UbW" (E++
9bUV]b['@c[[]b['Zcf'Ub'9I]gh]b['8 UHUVUgY" (E++
9bUV]b['@c[[]b['Zcf'U'BYk' 8 UHUVUgY" (E+-
8 UHUVUgY' A Ybi" (E, \$
DfYgYbhUh]cb' H]a Y" (E, \$
J]Yk '<]ghcfm" (E, %
5fW]j Y'@c[" (E, &
5XX]b['U' 7cbbYWh]cb'hc'U'@c['5fW]j Y' 8 UHUVUgY" (E, '
FYa cj]b['FYgi' 'hg' Zfc a 'U' 8 UHUVUgY" (E, '
8]gUV]b['@c[[]b['cb'Ub'9I]gh]b['8 UHUVUgY" (E, (
8Y'Yh]b['5bU'mYX'GUa d'Yg" (E,)

Illustrations

:][i fY'(!%: fc b hDUb Y`'7cbhfc`g`UbX': i bW]cbg.....(E+
:][i fY'(!&'6i fb'DfcZ]Y.....(E) (

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Front Panel Controls and Functions

NOTE → FYZYf'hc :][i fY'(!%ž'dU[Y'(E+ž'Zcf'cWWh]cbg'cZWtbhfc'g'UbX']bX]WWhcfg''

Power On/Off Switch—Gk]hW Yg'dck Yf'cb'UbX'cZZ'h'Y'XYHfa]bUhcf''H'Y'dck Yf'gk]hW']g'U'gc'U'WfW]h'VfYU_Yf'z'dfcj]X]b['dfchYWh]cb'Zcf'h'Y'cdYfUhcfz'XYHfa]bUhcfz'UbX'ZUW]hm' H'Y'Dck Yf'Cb#CZZGk]hW']g'cWWhYX'cb' h'Y'f][\h'g]XY'cZH'h'Y']bgfhi a Ybh''

Incoming Helium Scrubber Reagent Tube—Di f]Z]Yg'h'Y']bWa]b['Wff]Yf' [Ug'Vm'fYa cj]b['7C & UbX'a c]ghi fY''

Aliquot Dose Reagent Tube—Di f]Z]Yg'h'Y' [Ug'YUj]b['h'Y'U]ei ch'XcgYf'UbX'WWhU'mgh'YUhYf'Vm'fYa cj]b['7C & UbX'a c]ghi fY''

Catalyst Heater Assembly—F Ya cj Yg'cl m[Yb'UbX'WUb[Yg'BCl'hc'B&'VYZcfY'h'Y'g'Ua d'Y' [Ug'YbhYfg'h'Y'H7'W'''

Loading Head—8i f]b['UbU'mg]g'z'U'g'Ua d'Y']g'd'UWX']b['h'Y'cUX]b['\YUX'UbX'Ui hca Uh'W'mXfdg']bhc'h'Y'Z'fbUW'Zcf'UbU'mg]g''

Autoloader—H'Y'Wfci gY']g'dcg]h]cbYX'UVcj Y'h'Y'cUX]b['\YUX'CbY'Wfci gY'Wb'\c'X'&- g'Ua d'Yg'UbX'Ui hca Uh'W'mXfd' h'Y'a]bhc'h'Y'cUX]b['\YUX'Zcf'UbU'mg]g''



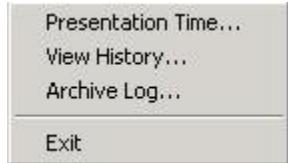
Figure 4-1
Front Panel Controls and Functions

Menu Overview

H\Y\Zc\`ck]b['UfY\h\Y\`a Ybi 'Wc]Wg]b\h\Y\`A]Wcgcz\`K]bXck g\`gcZh\k UfY\`GY\`Y\`W\`b['UbmicZ\h\YgY\`k]`cdYb\Ubch\Yf\gYh\`cZa Ybi 'Wc]Wg"



Database Menu



Presentation Time—FYZYf\hc\`DfYgYb\h\`cb\`H]a Y\`dU[Y\`(\`E, \$``

View History—FYZYf\hc\`J\`Yk\`<]ghcfm\`dU[Y\`(\`E, %``

Archive Log—FYZYf\hc\`5f\`W\`j Y\`@c[\`dU[Y\`(\`E, &``

Exit—I gYX\hc\`YI\`J\`h\h\Y\`Udd\`]W\`h\`cb\`dfc[fUa\`UbX\`fYh\`fbg\`hc\`h\Y\`Windows\`CdYfUh\`b['GmghYa ``

Edit Menu



Insert—bgYfhg\`U\`gUa d\`Y\`ci h\`cZgYei Yb\`W\`YYh\`YYb\`i bUbU\`mYX\`gUa d\`Yg\`]b\`h\`h\Y\`gdfYUXg\`YYh\`Zcf\`UbU\`mg]g\`FYZYf\hc\`bgYfh\`U\`GUa d\`Y\`dU[Y\`(\`E\` (\`z\`Zcf\`UXX]\`cbU\`)]b\`Zcfa Uh\`cb``

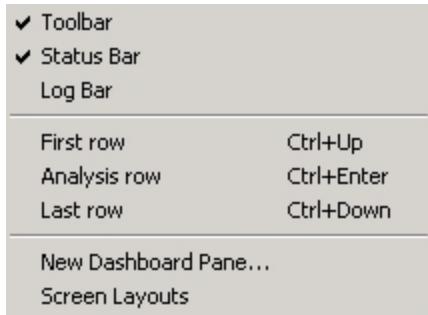
Fill—5\`fci d\`cZW\`g\`]b\`h\`Y\`gdfYUXg\`YYh\`W\`b\`YY\`ei\`]W\`mZ\`YX\`k\`]h\`h\Y\`gUa Y\`XU\`U\`FYZYf\hc\`:]`]b['7Y\`g\`k\`]h\`h\Y\`GUa Y\`dU[Y\`(\`E\` (\`z\`Zcf\`UXX]\`cbU\`)]b\`Zcfa Uh\`cb``

Cut—I gYX\hc\`XY\`Yh\`XUh\`Zcfa\`Ub\`Ybh\`fY\`fck\`]b\`h\`Y\`gdfYUXg\`YYh\`FYZYf\hc\`7i\`h\`dU[Y\`(\`E\`)\`Zcf\`UXX]\`cbU\`)]b\`Zcfa Uh\`cb``

Copy—I gYX\hc\`W\`dm\`XUh\`Zcfa\`Ub\`Ybh\`fY\`fck\`]b\`h\`Y\`gdfYUXg\`YYh\`h\`h\Y\`W\`dVcUfX\`FYZYf\hc\`7cdm\`dU[Y\`(\`E\`)\`Zcf\`UXX]\`cbU\`)]b\`Zcfa Uh\`cb``

Paste—I gYX\hc\`dUg\`h\`XUh\`Zcfa\`h\`h\Y\`W\`dVcUfX\`h\`h\`U\`gY\`Y\`W\`YX\`fck\`]b\`h\`Y\`gdfYUXg\`YYh\`FYZYf\hc\`DUg\`h\`dU[Y\`(\`E\`)\`Zcf\`UXX]\`cbU\`)]b\`Zcfa Uh\`cb``

View Menu



Toolbar—Hc[[`Yg`h\Y`hcc`VUf`cZ`cf`cb``FYZYf`hc`<]XY#G\ck`h\Y`Hcc`VUfž dU[Y` (E&- ž Zcf`UXX]h]cbU`]bZcfa Uh]cb””

Status Bar—Hc[[`Yg`h\Y`ghUh`g`VUf`cZ`cf`cb``FYZYf`hc`<]XY#G\ck`h\Y`GhUh`g`6Ufž dU[Y` (E` \$ž Zcf`UXX]h]cbU`]bZcfa Uh]cb””

Log Bar—8]gd`Um[g`a YggU[Yg`h\Uh`UfY`UXXYX`hc`h\Y`c[`Z]Y``FYZYf`hc`@c[`6Ufž dU[Y` (E` \$ž Zcf`UXX]h]cbU`]bZcfa Uh]cb””

First Row—5i hca Uh]W`migYYWg`h\Y`Zfgh`fck`cZXUHU`]b`h\Y`gdfYUXg\YYh`FYZYf`hc` ; c`hc` :]fgh`Fck`]b`h\Y`GdfYUXg\YYhž dU[Y` (E` \$ž Zcf`UXX]h]cbU`]bZcfa Uh]cb””

Analysis Row—5i hca Uh]W`migYYWg`h\Y`UbU`mg]g`fck`cZXUHU`]b`h\Y`gdfYUXg\YYh`FYZYf`hc` ; c`hc` 5bU`mY`Fck`]b`h\Y`GdfYUXg\YYhž dU[Y` (E` \$ž Zcf`UXX]h]cbU`]bZcfa Uh]cb””

Last Row—5i hca Uh]W`migYYWg`h\Y`Ugh`fck`cZXUHU`]b`h\Y`gdfYUXg\YYh`FYZYf`hc` ; c`hc` @Ugh`Fck`]b`h\Y`GdfYUXg\YYhž dU[Y` (E` \$ž Zcf`UXX]h]cbU`]bZcfa Uh]cb””

New Dashboard Panel—DYfa]hg`h\Y`cdYfUhcf`hc`W\YUhY`cf`YX]h`h\Y`dfcdYfh]Yg`cZh\Y`XUg\VcUfX` : cf`a cfY`]bZcfa Uh]cb`fYZf`hc`7fYUh]b`[`U`8Ug\VcUfX`DUbYž dU[Y` (E&(`

Screen Layouts—DYfa]hg`h\Y`cdYfUhcf`hc`gUj`Y`U`gW\YYb`Umci`h\UZhYf`WtbZ]`i`fUh]cb`6mgUj`]b[`h\Y`gW\YYb`Umci`h\h\Y`cdYfUhcf`W\fb`fYh`fb`hc`U`dfYj`]ci`g`gW\YYb`Umci`h\ei`]W`m`GW\YYb`Umci`hg`W\fb`VY`gUj`YX`Zcf`gd`YW\Z`WUdd`]W\h]cbg`FYZYf`hc`GW\YYb`@Umci`hgž dU[Y` (E&-`

Samples Menu

Login...	F3
Login Drift Samples...	
Balance	F4
Analyze	F5
Abort	F6
Pause	F7
Promote	Alt+Up
Promote : Analyze Next	Alt+Return
Demote	Alt+Down
Recalculate	
Transmit	
Print...	Ctrl+P
Print Preview	
Print Setup...	
Text Import Data...	
Text Export Data...	
Text Export Buffers...	
Transfer Export...	
Transfer Import...	
Sign...	
View Signatures...	
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Login—I gYX`hc ``c[]b`U`gUa d`Y`cf`U`ghUbXUfX`]bhc`h\Y`gdfYUXg\YYh`FYZYf`hc ``GUa d`Y`@c[]bž`dU[Y) È%ž`Zcf`UXX]h]cbU`]bZcfa Uh]cb”

Login Drift Samples—I gYX`hc ``c[`U`Xf]Zh`gUa d`Y`]bhc`h\Y`gdfYUXg\YYh`FYZYf`hc `GUa d`Y`@c[]bž`dU[Y) È%ž`UbX`8f]Zh`7cffYW]cbž`dU[Y) È`\$ž`Zcf`UXX]h]cbU`]bZcfa Uh]cb”

Balance—I gYX`hc `YbhYf`U`a Ugg`Zfc a`h\Y`VU`UbW`]bhc`h\Y`gUa d`Y`c[]b`gWYYb`FYZYf`hc `9bhYf`U`A Ugg`Zfc a`h\Y`6U`UbWž`dU[Y) È%ž`Zcf`UXX]h]cbU`]bZcfa Uh]cb”

Analyze—8]gd`Umø`h\Y`gUa d`Y`c[]b`gWYYb`hc ``c[`]b`UbX`UbUmnY`U`gUa d`Yž`UbUmnY`U`ghUbXUfXž`cf`UbUmnY`a i`h]d`Y`gUa d`Yg`FYZYf`hc `5bU`m]b[`U`GUa d`Yž`dU[Y) È%ž`Zcf`UXX]h]cbU`]bZcfa Uh]cb”

Abort—I gYX`hc `ghcd`cf`UVcfh`Ub`UbU`mg]g`FYZYf`hc `5Vcfh]b[`Ub`5bU`mg]gž`dU[Y) È&ž`Zcf`UXX]h]cbU`]bZcfa Uh]cb”

Pause—H\Y`cdYfUhcf`W\Ub`ghcd`cf`dUi`gY`UbU`mg]g`Uh`U`gY`YWWYX`gUa d`Y`UbX`h\Y`Y`fYgi a`Y`Uh`U`dfc[fUa a`YX`XUhY`UbX`h]a`Y`FYZYf`hc `DUi`g]b[`5bU`mg]gž`dU[Y) È&ž`Zcf`UXX]h]cbU`]bZcfa Uh]cb”

Promote—A cj`Yg`Ub`i`bUbU`mnYX`gUa d`Yž`k`]h]b`h\Y`gUa d`Y`]ghž`i`d`h\Y`]gh`hck`UfX`h\Y`bYI`h`gUa d`Y`hc`VY`UbU`mnYX`

Promote: Analyze Next—A cj`Yg`Ub`i`bUbU`mnYX`gUa d`Yž`k`]h]b`h\Y`gUa d`Y`]ghž`i`d`h\Y`]gh`UbX`dcg]h]cbg`]h`Ug`h\Y`bYI`h`gUa d`Y`hc`VY`UbU`mnYX`

Demote—A cj`Yg`Ub`i`bUbU`mnYX`gUa d`Yž`k`]h]b`h\Y`gUa d`Y`]ghž`Xck`b`h\Y`]gh`hck`UfX`h\Y`Ugh`gUa d`Y`hc`VY`UbU`mnYX`

Recalculate—*5ZhYf Ub UbUmg]g]g Wta d`YhYz fYwWw UhY fYgi hg Wjb VY i gYX hc fYwWw UhY hY fYgi h]Z hY YI hfUWcb XUhU cf W]VfUhcb \ Ug Vw Ub[YX" FYZf hc FywWw Uhjb [FYgi hg dU[Y) E') ž Zcf UXxjhcbU]bZcfa Uhjb"*

Transmit—*HfUbga Jhg Y YwWYX gUa d`Yg UbX hfUbga Jhg gY YwWYX UbUmnYX gUa d`Yg k Jh U`XUhU Zcfa Uh hc U\cghWta di hYf" FYZf hc HfUbga JhGY YwWYX GUa d`Yg dU[Y) E*) ž Zcf UXxjhcbU]bZcfa Uhjb"*

Print—*H Y df]bhWta a UbX UWYggYg hY fYdcfhgYh]b[g`X]Uc[`Vcl hc df]bhgY YwWYX gUa d`Y fYgi hg cb hY gmghYa df]bhYf" FYZf hc Df]bh]b[F Ydcfhg ž dU[Y) E(\$ ž Zcf UXxjhcbU]bZcfa Uhjb"*

Print Preview—*H Y df]bhdfYj]Yk Wta a UbX UWYggYg hY fYdcfhgYh]b[g`X]Uc[`Vcl hc dfYj]Yk \ck gY YwWYX gUa d`Yg k ci X df]bhcb hY gmghYa df]bhYf" FYZf hc Df]bh]b[Zca hY GcZhk UfY ž dU[Y) E(' ž Zcf UXxjhcbU]bZcfa Uhjb"*

Print Setup—*Df]bhGYh d`dYfa Jhg hY cdYfUhcf hc WbZ[i fY hY df]bhYX dU[Y" H Y Wc]Wg UbX Zl bWcbg k] XYdYbX cb hY df]bhYf]b i gY"*

Text Import Data—*I gYX hc ja dcfhigUa d`Y XUhU Zcfa UbchYf gcZhk UfY Udd]Wjhcb" FYZf hc HYI h=a dcfh8Uhj dU[Y) E) ž Zcf UXxjhcbU]bZcfa Uhjb"*

Text Export Data—*I gYX hc YI dcfhigUa d`Y XUhU hc UbchYf gcfU[Y`cWjhcb] Y U ZcddmXjg_ FYZf hc 9I dcfhHYI h8Uhj dU[Y) E(\$ ž Zcf UXxjhcbU]bZcfa Uhjb"*

Text Export Buffers—*I gYX hc YI dcfhigY YwWYX gUa d`Y d`ch XUhU hc U`Z`Y cf UbchYf Udd]Wjhcb" FYZf hc 9I dcfhHYI h6i ZYfg ž dU[Y) E) ž Zcf UXxjhcbU]bZcfa Uhjb"*

Transfer Export—*I gYX hc 9I dcfhGUa d`Y 8UhU hc U:]Y" H Y Z`Y Wb VY gUj YX cb hY gmghYa g\UXfj Y cf hfUbgZYffYX hc UbchYf a YX]U`Zcf gUZY gcfU[Y" FYZf hc HfUbgyf 9I dcfh ž dU[Y) E** ž Zcf UXxjhcbU]bZcfa Uhjb"*

Transfer Import—*I gYX hc =a dcfhGUa d`Y 8UhU Zcfa U:]Y`UbX fYgcfY]h]b hY gdfYUXg YYh`H Y Z`Y UX hc VY gUj YX i g]b[9I dcfhGUa d`Y 8UhU hc U:]Y" FYZf hc HfUbgyf =a dcfh ž dU[Y) E* +ž Zcf UXxjhcbU]bZcfa Uhjb"*

Sign—*I gYX hc UXxUg][bUh fY hc U`gUa d`Y h UhYbgi fYg hY j U]X]hmicZhY gUa d`Y]bZcfa Uhjb \ Ug fYa U]bYX hY gUa Y g]bW]h k Ug g][bYX" FYZf hc GUa d`Y G][bUh fY ž dU[Y) E' , ž Zcf UXxjhcbU]bZcfa Uhjb"*

View Signatures—*I gYX hc j]Yk U`gUa d`Y g][bUh fY UbX XYhYfa]bY]Z]h]g`j U]X" FYZf hc J]Yk]b[G][bUh fY ž dU[Y) E' - ž Zcf UXxjhcbU]bZcfa Uhjb"*

Delete—*8Y`YhY U`gUa d`Y fYa cj Yg U`gY YwWYX gUa d`Y k Jh gUa d`Y XUhU Zcfa hY gdfYUXg YYh`FYZf hc 8Y`Yh]b[U`GUa d`Y ž dU[Y) E') ž Zcf UXxjhcbU]bZcfa Uhjb"*

View History—*I gYX hc cc _UhU\]ghcfm`c[cZhY UWcbg dYfZcfa YX cb U`gY YwWYX gUa d`Y" FYZf hc J]Yk]b[<]ghcfmž dU[Y) E' +ž Zcf UXxjhcbU]bZcfa Uhjb"*

Configuration Menu



Calibration—A UhW Yg hY fYgdcbgY cZh hY]bghfi a Ybh hc _bck b 'W]VfUh]cb gJa d'Yg' FYZf hc '7U]VfUh]cb z dU[Y) E& ž Zcf UXx]h]cb U']bZcfa Uh]cb"

: fca 'hY '7U]VfUh]cb Zmci h a Ybi 'hY cdYfUhcf 'Wb gY YW B Yk 'GhJbXufX '7U]VfUh]cb z dU[Y) E&+/ '5XX 'GhJbXufXg z dU[Y) E&, / J]Yk '7U]VfUh]cb z dU[Y) E&, / 'UbX '9X]h 7U]VfUh]cb z dU[Y) E&- "

Blank—8YhYfa]bYg hY 'Ua ci bh'cZ'V'Ub_ 'UbX'UX'1 ghg' hY 'W]VfUh]cb fIufYU E' UWtfx]b['m' FYZf hc '6'Ub_ '7U]VfUh]cb z dU[Y) E&* ž Zcf UXx]h]cb U']bZcfa Uh]cb"

Drift—5X'1 ghg' hY 'cf][]bU 'W]VfUh]cb fYgdcbgY hc a UhW hY 'W ffYbh]bghfi a Ybh fYgdcbgY' FYZf hc '8f]zh 7cffYW cbz dU[Y) E' \$ž Zcf UXx]h]cb U']bZcfa Uh]cb"

: fca 'hY '8f]zh Zmci h a Ybi 'hY cdYfUhcf 'Wb gY YW 8f]zh 7cffYW cbz dU[Y) E' \$ž J]Yk]b[<]ghcfm z dU[Y) E' %ž UbX 'FYd'UW]b['8f]zh GJbXufX z dU[Y) E' &"

IR Detectors—H]g'dfcWxi fY dYfa]hg hY cdYfUhcf hc 'UX'1 gh' hY]bghfi a Ybh XYhY Wcf]bYuf]hmVmUdd'm]b['X]ZyfYbh WffYW cb ZWtcfh hc 'hY XYhY Wcf' @bYuf]nUh]cbg'cb'mUZZW hY]bYuf]hmicZh hY =F '7Y'g' FYZf hc' F '8YhY Wcf' @bYuf]nUh]cb z dU[Y) - E' +"

Standards—I gYX hc 'YbhYf gJbXufXg]bhc 'hY 'W]VfUh]cb gJbXufXg']gh' FYZf hc' @c[[]b['b i g]b['7U]VfUh]cb FYZfYbW A UhYf]U z dU[Y) (E) * ž Zcf UXx]h]cb U']bZcfa Uh]cb"

Methods—I gYX hc 'WYUhY 'U'a Yh cX Zcf 'UbU'ng]g' FYZf hc '7fYUhb['UbX'A cX]Zn]b['U' A Yh cX z dU[Y) (E) (ž Zcf UXx]h]cb U']bZcfa Uh]cb"

Counters—5i hca UhW mXYhYfa]bYg'k 'Yb 'dYf]cX]Wa U]b hYbUbW]g' bYW ggUfm' A U]b hYbUbW XUh h h'Uh'k Ug' YbhYfYY]bhc 'c[]b 'dYf]cX]Wa U]b hYbUbW]g' i gYX' Vm'h Y 'Wt b hYfg hc 'XYhYfa]bY'k 'Yb 'a U]b hYbUbW]g' bYW ggUfm' FYZf hc' 7cbZ[i f]b['A U]b hYbUbW '7ci b hYfg z dU[Y) * E' * ž Zcf UXx]h]cb U']bZcfa Uh]cb"

User Defined Fields—DYfa]hg hY cdYfUhcf hc 'UXX'U'i b]ei Y'Z]Y'X' hc 'hY gdfYUXg\ YYh UbX'gJa d'Y'c[]b'gWYYb' 'Hh Y'Z]Y'X'Wb]bW XY'U'Zcfa i 'U'Zcf 'W'W 'Uh]cb 'cf 'Wb hU]b' cb'mhYgh' FYZf hc' I gYf '8Yz]bYX' :]Y'Xg z dU[Y) (E) (ž Zcf UXx]h]cb U']bZcfa Uh]cb"

Sample Templates—5 ei]W k UmZcf h Y cdYfUhcf hc c []b U gUa d Y UbX YbHf U a Yh cXz Wta a Ybh UbX XYgW dh cb " 7fYUhY U gUa d Y hYa d UhY g i gYX hc XYj Y cd U gdYVWZ WgUa d Y hYa d UhY 5ZhYf U gUa d Y hYa d UhY g XYj Y cdYXz i gY gUa d Y hYa d UhY hc c []b U gUa d Y k]h dfYXYHf fa]b YX gUa d Y UbU mg g XUhU FYZYf hc GUa d Y Hya d UhYg dU[Y (E), z Zcf UXx]h cbU]b Zcfa Uh cb "

System—7cbZ[i fY gnghya gYhg h Y c j YfU]bghfi a Ybh cdYfUh]b [gYh]b [g hc WbZ[i fY h Y bghfi a Ybh Zcf U gdYVWZ WUdd]W h cb cf gYh cZ Udd]W h cbg FYZYf hc Gmghya 7cbZ[i fUh]cb dU[Y (E % z Zcf UXx]h cbU]b Zcfa Uh cb "

Users—8YHf fa]b Yg k \]W cdYfUhcfg Wb i gY h Y]bghfi a Ybh UbX k \ UhZ b W cbg h Ym Wb i gY FYZYf hc 8YHf fa]b]b [i gYf DYfa]gg]cbg dU[Y (E % z Zcf UXx]h cbU]b Zcfa Uh cb "

Transmission Formats—6YZcfY XUhU Wb VY hfUbga]h YX hc U cgh Wta di hYfz h Y hfUbga]h YX XUhU Zcfa Uh a i gh VY WbZ[i fYX hc a UhW h Y \ cgh fYei]fYa Ybh g Y hfUbga]gg]cb Zcfa Uh g h WbZ[i fY XUhU hfUbga]gg]cb FYZYf hc hfUbga]h cfa Uh 7cbZ[i fUh]cb dU[Y (E) + z Zcf UXx]h cbU]b Zcfa Uh cb "

Select Language—DYfa]hg h Y i gYf hc GYVWb [U @Ub[i U[Y dU[Y (E % z cZ h Y gcZhk UfY " 5 g h cZ Uj U]UVY Ub[i U[Yg k] VY X]gd UmYX "

NOTE → H Y C b! VcUfX a Ubi U k] fY a U]b]b 9b []g \ fY [UfX Ygg cZ Ub[i U[Y W cgYb "

Auto Widths—5i hca Uh W mUX i ghg h Y k]Xh \ cZ YUW W h Z h h Y hYi h : cf]bghfi W cbg gYY 5i hc K]Xh g dU[Y (E \$ z Zcf UXx]h cbU]b Zcfa Uh cb "

Display—GYhg h Y XYg_hcd W UfUWYf gh]Wg Uj]Yk YX cb h Y Wta di hYf a cb]hcf FYZYf hc 8]gd Um 7cbZ[i fUh]cb dU[Y (E % z Zcf UXx]h cbU]b Zcfa Uh cb "

Sample Filters—GUa d Y :]hYfg g i gYX hc X]gd UmigUa d Y XUhU VUgYX cb U dfYXYZ b YX fYei]fYa Ybh FYZYf hc GUa d Y :]hYfg dU[Y (E % z Zcf a cfY]b Zcfa Uh cb "

Diagnostics Menu



Ambient Chart—GY`YVW`5a V]Ybh`7\Ufh`hc`a cb]hcf`h Y`GmghYa `CdYfUh]b[`DUfUa YhYfg` UbX`X]gd`Umh`Y`5a V]Ybh`A cb]hcf`Ug`U`7\Ufh`UbX` ; fUd\ ``5`` dUfUa YhYfg`Wb`VY` X]gd`UmYX`` FYZYf`hc ``5a V]Ybh`A cb]hcf`dU[Y` , E` ``

Solenoids—GY`YVW`Gc`Ybc]Xg`hc`hc[[`Y`h`Y`Gc`Ybc]X`J`U`j`Yg`hc`j`Yf]ZmidfcYf` cdYfUh]cbz`X]U[bbgY`]bghfi a Ybh`dfcV`Ya g`UbX`dYfZcfa `dYf]cX]Wa UjbhYbUbW` `` FYZYf`hc` Gc`Ybc]Xg`UbX`Gk`]hN`Yg`dU[Y` , E`&``

Leak Check—GY`YVW`@YU_`7\YW`hc`XYhYfa]bY`]Z`h`Y`]bghfi a Ybh`Ug`U`Y`]i a `cf` Wff]Yf`[Ug`YU_ `` FYZYf`hc`@YU_`7\YW`z`dU[Y` , E`%``

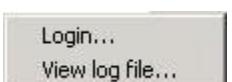
System Check—GmghYa `W`YVW`dYfa]hg`h`Y`cdYfUh]cb`hc`Ui`hca Uh]W`m`W`YVW`BYh`cf_` 7ca a i b]W`h]cbg`Gc`Ybc]X`CdYfUh]cbz`DbYi a Uh]WDFYggi fYz`GmghYa `DfYggi fYz` HYa dYfUh` fYz` ; Ug` `ck`UbX`f`UbX`H7`7Y`g` `` FYZYf`hc` GmghYa `7\YW`z`dU[Y` , E`%``

Furnace—GY`YVW`i`fbUVW`hc`hYgh`UbX`a`cb]hcf`h`Y` ; i`fbUVW`Zcf`dfcdYf`cdYfUh]cb` `` FYZYf`hc` ; i`fbUVW`8]U[bbg]W`z`dU[Y` , E`%``

Calibration—GY`YVW`7U`VfUh]cb`hc`gYh`h`Y`VUfca Yhf]WdfYggi fYz`W`]VfUhY`h`Y` V`a Vi g]cb`Zck z`UX`i`gh`h`Y`H7`W` `` UbX`dYfZcfa `U`VUW`i`d`W`]VfUh]cb` `` FYZYf`hc` 7U`]VfUh]cbg`z`dU[Y` , E`*``

Network—GY`YVW`BYh`cf_`hc`hYgh`h`Y`9`YVW`fc]W5ggYa V`]Yg`UbX`i`d`fUXY` :`]fa`k`UfY` `` FYZYf`hc` BYh`cf_`8]U[bbg]W`z`dU[Y` , E`%``

Maintenance Menu



Log-In—I`gYX`hc`c[`]b`dYf]cX]Wa U]b`hYbUbW`UZhYf`]h`k`Ug`dYfZcfa YX`` FYZYf`hc` @c[`]b[`]b`DYf]cX]WA U]b`hYbUbW`z`dU[Y` * E` (z`Zcf`UXX]h]cbU`]bZcfa Uh]cb` ``

View Log File—H`Y`gmghYa `k`]``Ui`hca Uh]W`m`YYd`U`fYWtfX`cZj`Uf]ci`g`dfcW`Xi`fYg` h`Uh`k`YfY`dYfZcfa`YX`` H`Y`fYWtfX`Wb`VY`j`]Yk`YX`i`g]b[`j`]Yk` ``c[`Z`Y`` FYZYf`hc` J`]Yk`]b[`@c[`:`]Y`z`dU[Y` * E`) z`Zcf`UXX]h]cbU`]bZcfa Uh]cb` ``

Applying Power

- %" H\Y\dck Yf'gk]h\W\`cb\h\Y\f][\h\g]XY\cZ\h\Y]bghfi a Ybh\g\ci `X\VV]b\h\Y\cZ\dcg]h\cb"
- &" 7ccbY\W\h\Y]bghfi a Ybh\h\c\h\Y\dfcdYf`Y\Y\W\`dck Yf'gci f\W\]Z]h\k Ugb\h\Xcb\Xi f]b[]bghU\h\cb`FYZYf'h\c`bghU\]b[\h\Y`bghfi a Ybh\z\du[Y\&E(\z Zcf'UXX]h\cb`]bZcfa Uh\cb"
- ' " Hi fb\`C\`h\Y[Ug\gi dd]Yg\k]h\h\Y\fY[i\`Uhcfg\Uh\h\Y[Ug\h\Ub_g\`H\Y\cl m[Yb\UbX\Y]ji a g\ci `X\VV\gYh\h\c)dg]f&"(%VUf\`H\Y\`dbYi a Uh\Wg\ci `X\VV\gYh\h\c(\$dg]f&+*`VUf\`
- (" Hi fb\`C\`b\`57\`dck Yf\h\c\h\Y]bghfi a Ybh\UbX\W\`a di h\Yf\`DYfa]h\h\Y\W\`a di h\Yf\h\c`Vcc\`i d\`UbX\`fi b\h\Y\`Udd]W\h\cb\`dfc[f\`Ua "
-) " 5\`ck\`h\Y\h\Y\`dYfUhi fY\h\c`ghUV]nY\Zcf\`cbY\`ci f\`VY\ZcfY\`dYfZcfa]b[\`U\`gmgh\`Ya\`W\`Y\`cf\`g\`Ua\`d\`Y\`UbU\`mg]g"
- * " 5\`W\`gg\`h\Y\`5a\`V]Ybh\`A\`cb]h\cf`FYZYf\h\c\`5a\`V]Ybh\`7\`Uf\`h\z\du[Y\`E\`"
- + " J Yf]Zm\`h\`Uh\h\Y\`fY\`bc\`U\`Ufa\`g]bX]W\`h\Y\`Vm\`Ub\`YI\`W\`Ua\`Uh\cb\`a\`Uf\`Y\`]b\`U\`m\`Y\`ck\`Vcl\`h\`h\Y\`Y\`Z\`h\`Y\`dUf\`Ua\`Yh\Yf\`5\`U\`Ufa\`g\`a\`i\`gh\`VY\`W\`Uf\`Y\`VY\`ZcfY\`dYf\`Zcfa\`]b[\`U\`g\`Ua\`d\`Y\`UbU\`mg]g\`Hc\`W\`Uf\`Ub\`U\`Ufa\`]h\`a\`Um\`VY\`b\`Y\`W\`gg\`Uf\`m\`h\`dYf\`Zcfa\`Uf\`Xk\`Uf\`Y\`W\`]Vf\`Uh\`cb\`Z\`gmgh\`Ya\`a\`U\`jbh\`Y\`Ub\`W\`cf\`k\`U\`]h\`U\`Udd\`fcdf\`Uf\`Y\`Ua\`ci\`b\`h\`c\`Z\`h\`a\`Y\`Zcf\`h\`Y\`]bghfi a Ybh\h\c\`k\`Ufa\`!i\`d\`FYZYf\h\c\`8]U[bcgh\`W\`h\z\du[Y\`E\%`UbX\`GYf\`]W\`h\z\du[Y\`-E\%`Zcf\`a\`cf\`Y\`]bZcfa\`Uh\cb"



CAUTION

POSSIBLE LEAK CHECK ERROR

The furnace temperature must reach the set temperature and stabilize before performing a leak check. Unstable furnace temperature may cause erroneous leak check results.

- " DYfZcfa\`U\`Gmgh\`Ya\`7\`Y\`W\`h\`c\`XYh\`Yfa\`]bY\`]Z\`h\`Y\`]bghfi a Ybh\`]g\`cdYf\`U\`h\`b[\`dfcdYf\`m\`FYZYf\h\c\`Gmgh\`Ya\`7\`Y\`W\`h\z\du[Y\`E\%`"
- " DYfZcfa\`U\`@YU_\`7\`Y\`W\`FYZYf\h\c\`@YU_\`7\`Y\`W\`h\z\du[Y\`E\%`"

Selecting a Language

GY`YV@Ub[i U[Y'dYfa]hg'h Y'cdYfUhcf'hc'gYYV@Ub[i U[Y''H Y'Uj U]UVY'Wc]Wg'UddYUf'cb'h Y'gWYYb'"
5'hci [\h Y'Ub[i U[Y'cZ'h Y'gcZh UfY'k]'WUb[Yz'h Y'cbVcUfX'a Ubi U'k]'fYa U]b'jb'9b['g\''"
H Y'ghcZ'Ub[i U[Yg'X]gd'UmYX]b'h Y'Z'ck]b['gWYYb'g\ch]g'i gYX'Ug'Ub'YI Ua d'Y'
UbX'a Umj UfmZca 'h Y'UV@Ub[i U[Yg'X]gd'UmYX'cb'mci f'Wa di hYf'a cb]hcf'"
%" : fca 'h Y'7cbZ[i fUh]cb'a Ybi zWccgY'GY`YV@Ub[i U[Y''H Y'GY`YV@Ub[i U[Y'
X]Uc['Vcl 'k]'UddYUf'"



&" GY`YV@Ub[i U[Y'XYg]fYX"
' " GY`YV@C?"'GcZh UfY'k]'Wbj Yfh'h c'Ub[i U[Y'WcgYb"

Determining User Permissions

I gYfg`cb`h\Y`7cbZ[i fUh]cb`a Ybi ` \Y`dg`dfYj Ybh`i bUi h\cf]nYX`cdYfUh]cb`VmldYfa]h]b[h\Y`gmghYa `UXa]b]ghfUhcf`hc`Ugg][b`dYfa]gg]cb`Zcf`i gYfg`hc`dYfZcfa`gY`YWMYX` Z`bW]cbg]b`h\Y`]bghfi a Ybh`gcZk UfY`H\Y`Zc`ck]b[`gYWM]cb`YI`d`U]bg`ck`hc`UXX`i gYfg`hc`h\Y`Windows`CG`fC`dYfUh]b[`GmghYa E`cb`h\Y`cW`D7`UbX`ck`hc`UXX`i gYfg`hc`h\Y`]bghfi a Ybh`h\fc`i [\`U`b`Yh`cf_#Xca U]b`c[]b`"

Adding User in Windows OS

Hc`UXX`U`i gYfz`fYZf`hc`h\Y`Windows`CG`Y`d`gmghYa `Ug`Zc`ck g` .
%" : fca `h\Y`XYg_hcdz`gY`YWM`GHUfh`UbX`h\Yb`gY`YWM<Y`d`<Y`d`a Um`VY`fYZffYX`hc`Ug`
<Y`d`UbX`Gi ddcfh`XYdYbX]b[`cb`h\Y`Windows`CG`h\Uh]g`i gYX` .
&" =b`h\Y`gYUfW`Vcl z`hmdY`i gYfg`UbX`DUggk cfXg` .
' " A U`Y`U`gY`YWM]cb`Zfc`a h\Y`i gYfg`UbX`DUggk cfXg`cdh]cbg`]ghz`gY`YWM`8]gd`Um`UbX`
Zc`ck`h\Y`]bghfi W]cbg`dfcj]XYX` .

Adding Users to Instrument Software

H\Y`Zc`ck]b[`gYWM]cb`YI`d`U]bg`ck`hc`UXX`i gYfg`hc`h\Y`]bghfi a Ybh`gcZk UfY`H\Y`g`
dfcW`Xi fY`Udd`]Yg`k`Yb`U`i gYf`]g`bch`Ugg][bYX`]b`h\Y`Windows`CG`cb`h\Y`cW`D7`Vi`h`
k`VY`c[]b[`cbh`h\Y`]bghfi a Ybh`h\fc`i [\`U`b`Yh`cf_#Xca U]b`c[]b` .
%" Cb`h\Y`7cbZ[i fUh]cb`a Ybi z`gY`YWM`gYfg`H\Y`i gYfg`X]U`c[`Vcl`k`Udd`YUf` .
&" Cb`h\Y`i gYfg`X]U`c[`Vcl z`gY`YWM`5XX`H\Y`k cfX`i`gYf`k`Udd`YUf`i bXYf`BUa`Y` .
' " GY`YWM`gYf`UbX`hmdY`]b`h\Y`b`Yh`cf_#Xca U]b`c[]b`Zcf`h\Y`i gYf`=Zh\Y`i gYf`
]XYbh]Z`W]h]cb`YbhYfYX`YfY`XcYg`bch`a UhW`h\Y`fYei`fYX`b`Yh`cf_#Xca U]b`c[]b`
Zcf`h\Y`i gYf`hc`c[`cb`h\Y`D7`Zfc`U`b`Yh`cf_z`h\Y`i gYf`k`bch`Uj`Y`h\Y`
dYfa]gg]cbg`XYg][bUhYX`]b`h\Y`gcZk UfY` .
(" F`YZf`hc`5XX]b[`cf`7`Ub[]b[`i gYf`DYfa]gg]cb`Zcf`=bghfi a Ybh`dU[Y`E%`z`Zcf`
]bghfi W]cbg`hc`Ugg][b`dYfa]gg]cbg`hc`]bX]j`]Xi`U`i gYfg` .

Changing Users in Windows OS

H\Y\Zc\`ck]b[`gY\W\cb\`YI d\U]bg\`ck \`hc\`W\Ub[Y\`i gYfg"\`H\]g\`dfc\W\Xi fY\`Udd\`]Yg\`Vch\`hc\`i gYfg\`Ugg][bYX\`b\`Windows\`UbX\`hc\`i gYfg\`UXXYX\`hc\`h\`Y\`bg\`fi a\`Ybh\`cb\`U\`bYh\`cf\`#Xca\`U\`b\`c[]b"

%" 7\`cgY\`h\`Y\`gc\`h\`k UfY"

&" Cb\`h\`Y\`XYg\`hcd\`gY\`Y\`W\`G\`Ufh\`UbX\`h\`Yb\`gY\`Y\`W\`@c[\`C\`Z\`H\`]g\`gh\`Yd\`k]``j Ufm\`XYd\`YbX\`b[\`cb\`h\`Y\`Windows\`CG\`h\`Uh\`]g\`i gYX"

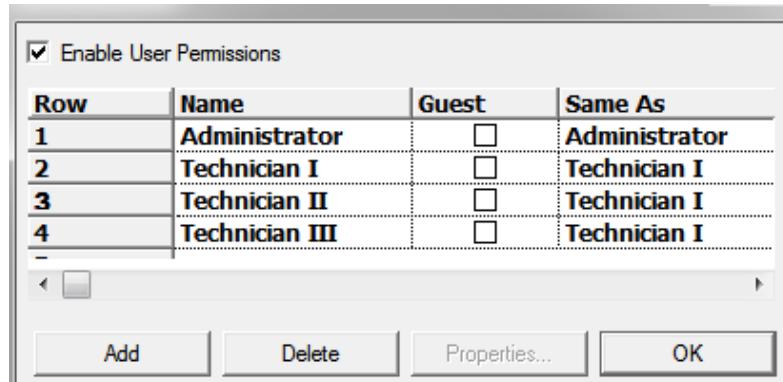
' " 9bh\`Yf\`h\`Y\`i gYfb\`Ua\`Y\`UbX\`d\`Uggk\`cfX\`hc\`c[\`cb\`h\`Y\`bYk\`i gYf"\`H\`]g\`gh\`Yd\`k]``j Ufm\`XYd\`YbX\`b[\`cb\`h\`Y\`Windows\`CG\`h\`Uh\`]g\`i gYX"

(" @c[\`]b\`hc\`h\`Y\`]bg\`fi a\`Ybh"

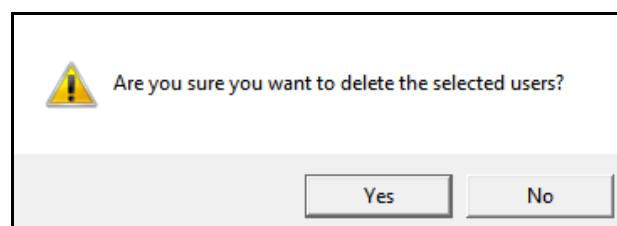
Deleting Users in the Instrument Software

Cb\`mi gYfg\`UXXYX\`hc\`h\`Y\`]bg\`fi a\`Ybh\`cb\`U\`bYh\`cf\`#Xca\`U\`b\`c[]b\`W\`b\`VY\`XY\`Yh\`YX\`i gYfg\`Ugg][bYX\`b\`h\`Y\`Windows\`CG\`W\`bbch\`VY\`XY\`Yh\`YX\`Z\`ca\`h\`Y\`i gYfg\`X\`U\`c[\`Vcl\`"

%" GY\`Y\`W\`7cbZ[i\`fU\`cb\`UbX\`gY\`Y\`W\`i gYfg"\`H\`Y\`i gYfg\`gW\`YYb\`k]``Udd\`YUf"



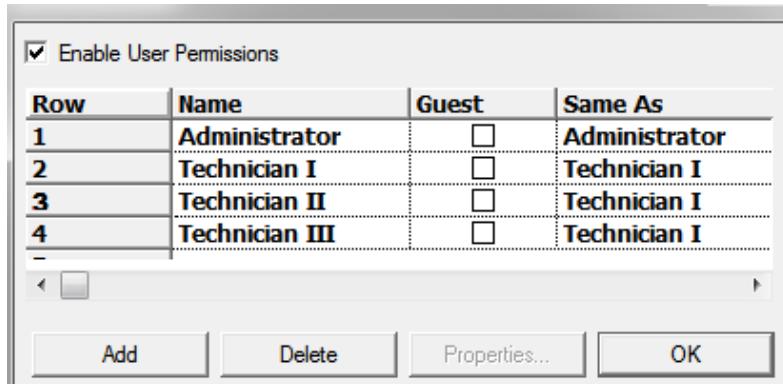
&" GY\`Y\`W\`h\`Y\`b\`Ua\`Y\`hc\`VY\`XY\`Yh\`YX\`UbX\`h\`Yb\`gY\`Y\`W\`8Y\`Yh\`Y\`5\`a\`YggU[Y\`X\`U\`c[\`Vcl\`k]``Udd\`YUf"



' " GY\`Y\`W\`Mg\`hc\`XY\`Yh\`Y\`i gYfb\`Ua\`Y\`/gY\`Y\`W\`Bc\`hc\`_YYd\`h\`Y\`i gYfb\`Ua\`Y\`"

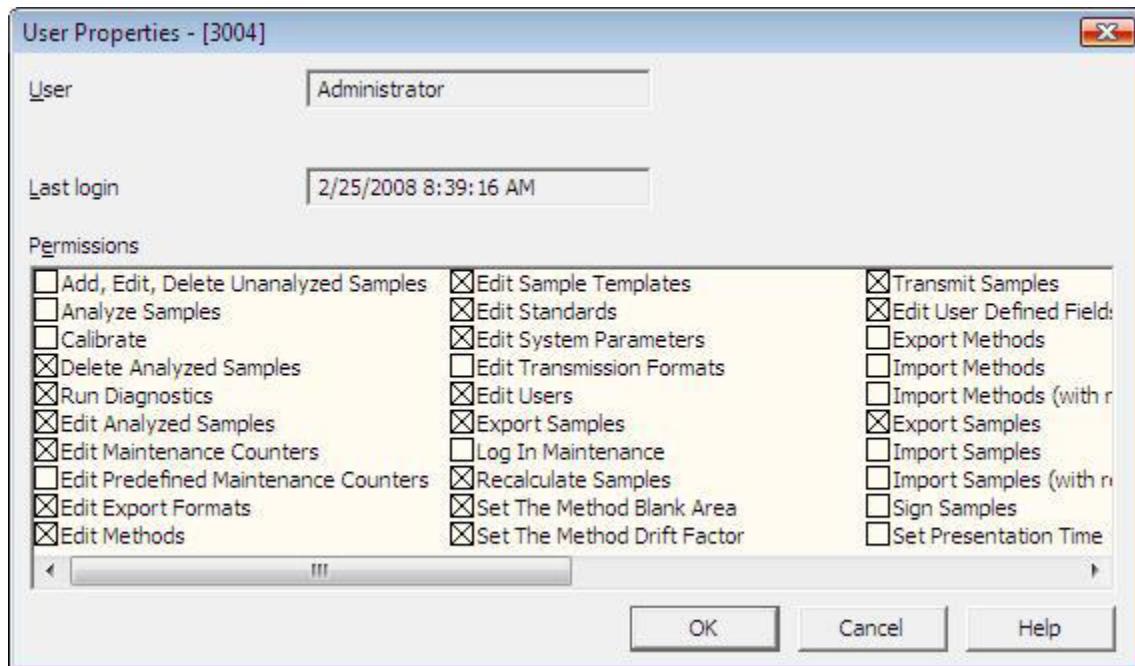
Adding or Changing User Permission for Instrument

I gYfgDbUa Yg'k]``UddYUf]b \h Y'B Ua Y'Wt'i a b'cZ\h Y'I gYfg'X]Uc['Vcl ''H\Y'WffYbh
 i gYf'c[[YX]bhc \h Y'Windows gmghYa 'k]``X]gd'Um]b 'V'i Y''''
 %" GY`YWW7cbZ[i fUh]cb'UbX'gY`YWWI gYfg''H\Y'I gYfg'gWYYb'k]``UddYUf''''
 5" Hc'X]gUVY'U``i gYf'dYfa]gg]cbg'Zcf'U'gdYW]ZWi gYf'z'd'UW'Ub'L']b \h Y'; i Ygh
 W't'i a b''K \Yb \h Y'i gYf'c[g'cb'hc \h Y'gmghYa z\h Ymk]``VY'Wfbg]XYfYX'U'
 ; i Ygh'UbX'k]``\Uj Y'F958!CB@MUWYgg'hc \h Y'gcZhk UfY'': cf'; i Ygh'i gYfg'z
 h\Y'V\YWW_Vcl Yg'']ghYX'cb'hc \h Y'I gYf'DfcYfh]Yg'X]Uc['k]``VY'VWUfYX'Ug'h\Ym
 Wbbch'dYfZcfa 'UbmicZ\h Y'hJg_g'']ghYX''''
 6" GY`YWW\h Y'9bUV'Y'I gYf'DYfa]gg]cbg'V\YWW_Vcl 'UbX'i gYf'dYfa]gg]cbg'k]``VY'
 V\YWW_YX'Xi f]b['h\Y'cdYfUh]cb'cZ\h Y']bghfi a Ybh'K \Yb \h Y'9bUV'Y'I gYf'
 DYfa]gg]cbg'V\YWW_Vcl 'g'VWUfYXz'i gYf'dYfa]gg]cbg'UfY'bch'V\YWW_YX'UbX'U''''
 i gYfg'V\Ub'dYfZcfa 'UbmZ b\V]cb'cb'hc \h Y']bghfi a Ybh''''
 &" Hc'Ugg][b'i gYf'dYfa]gg]cbg'z'gY`YWW\h Y'bUa Y'cZU'i gYf''''



' " =ZcbY'i gYf'fYe[jfYg'h\Y'YI UW'gUa Y'dYfa]gg]cbg'Ug'U'i gYf'h\h Uh'UfYUXm\Ug'
 dYfa]gg]cbg'Ugg][bYXz\h Y'GUa Y'5g'Wt'i a b'V\Ub'VY'i gYX'hc'gUj Y'hJa Y''''
 5" GY`YWW\h Y'bUa Y'cZ\h Y'i gYf'hc'UXX'cf'V\Ub[Y'dYfa]gg]cb'VmigY`YWW]b['b'
 h\Y'Fck 'Wt'i a b'Zcf'h\h Uh'i gYf''''
 6" G]b['Y! V\W_]b \h Y'GUa Y'5g'Wt'i a b''''
 7" : fca 'h\Y'']gh'gY`YWW\h Y'bUa Y'cZ\h Y'i gYf'h\h Uh'UfYUXm\Ug'h\h Y'gUa Y'
 dYfa]gg]cbg'Ugg][bYX''''

(" GY`YV\h DfcdYfh]Yg" `H\ Y\ gYf`DfcdYfh]Yg`X]U`c[`Vcl`k]``UddYUf"



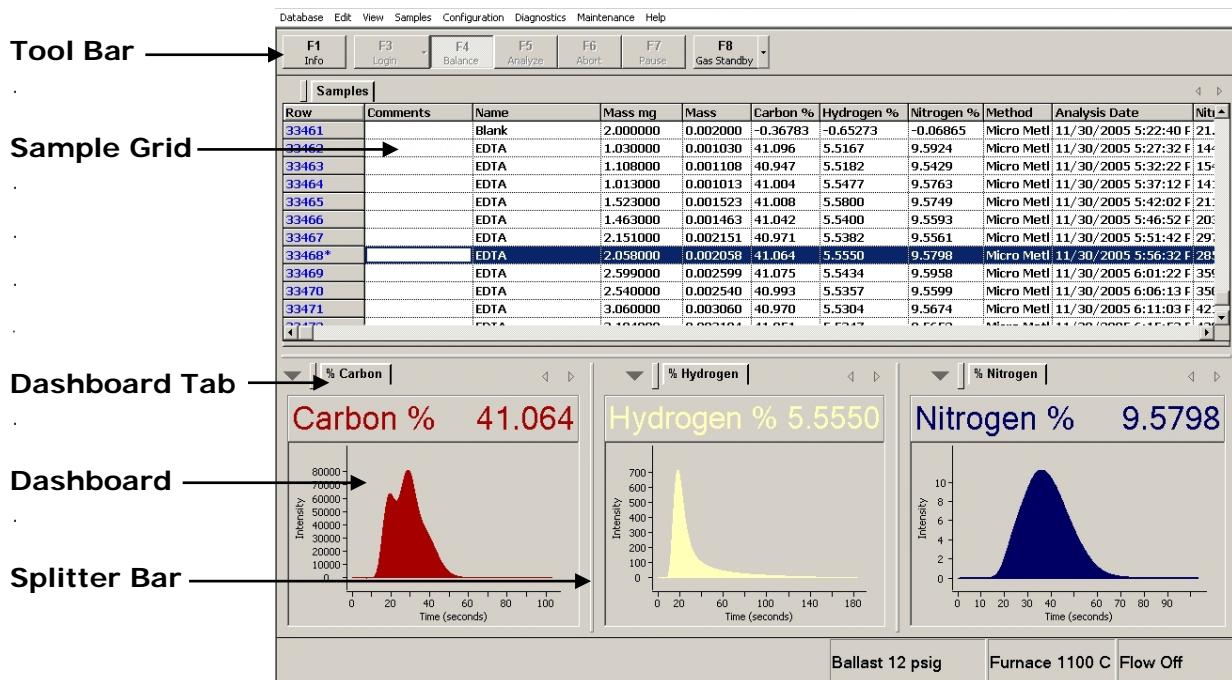
) " GY`YV\h h\ Y`XYg]fYX`W YW_Vcl Yg`hc`Ugg][b`cf`fYa cj Y\ i gYf`dYfa]gg]cb`Zcf`h\ Y`
Z\ bV\jcbg`]ghYX`]b`h\ Y`YX]h`Vcl "K \Yb`Ub`L`X]gd`Umgz`h\ Y\ i gYf`\Ug`dYfa]gg]cb`hc`
dYfZcfa`h\ Uh\Z\ bV\jcbg"

* " GY`YV\h C?`k \Yb`Z]b]g\YX`Ugg][b]b[`dYfa]gg]cbg"

Display Configuration

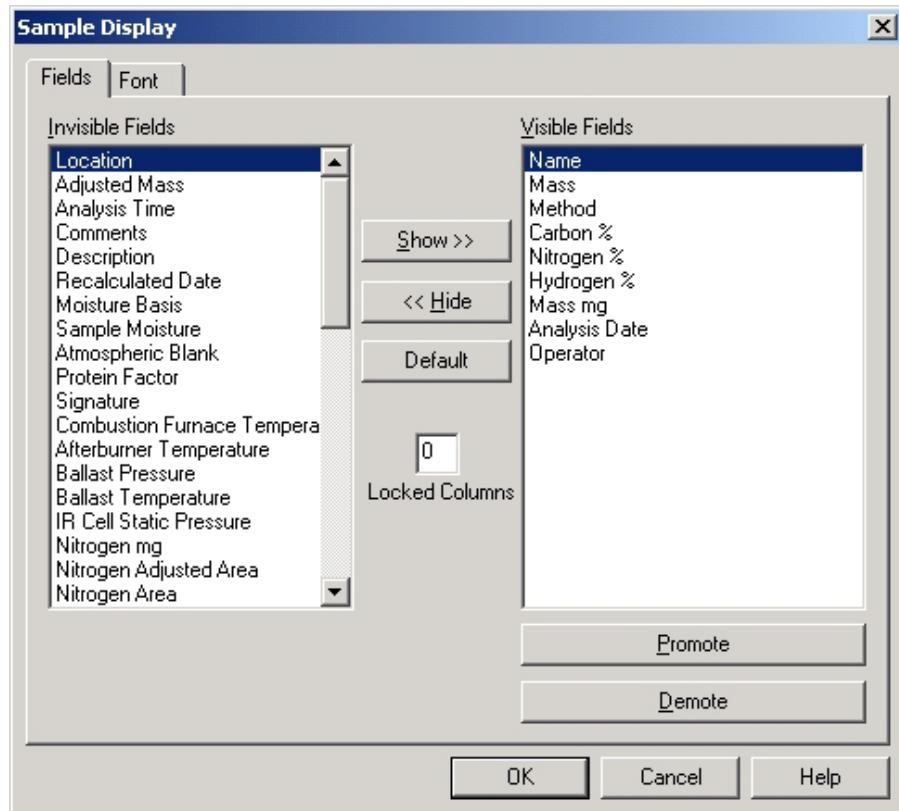
Main Screen Overview

H\Y'a U]b'gWYYb'UddYUfg'k \Yb'h\Y'XYhYfa]bUhcf'UbX'Wta di hYf'UfY'dck YfYX! i d"5' gWYYb'YI Ua d'Y'cZh\Y'XYZU[h'WtbZ[i fUhcb'g'g'ck b']b'h\Y'Zc'ck]b[gWYYb'g'ch' @_Y'a Ubm Windows'dfc[fUa g'z'h\Y'gWYYb'Wjb'VY'WtbZ[i fYX'Vm'h\Y'cdYfUhcf'Ug' XYg]fYX" GWYYb'Umci hg'cf'WtbZ[i fUhcbg'Wjb'VY'glJ YX'UbX'fYVW'YX"



Configuring Fields

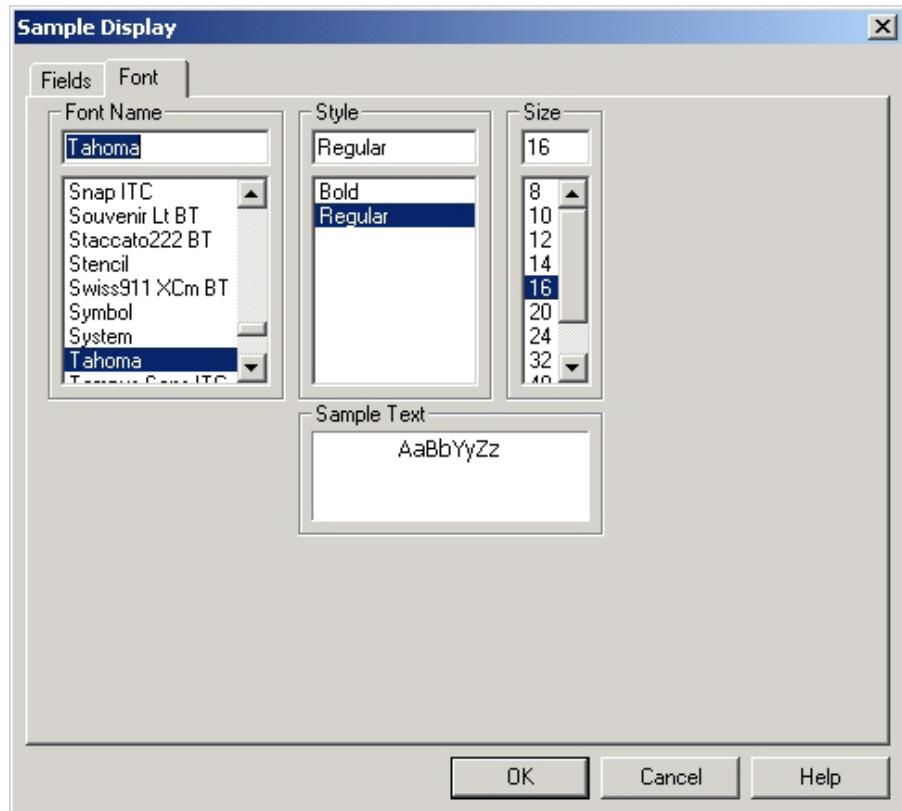
%": fca `h`Y`7cbZ[i fUh]cb`a Ybi žgYYW8]gd`Um`H`Y`GUa d`Y`8]gd`UmigWYYb`k]`
UddYUF"



&": GY`YW8:]Y`Xg`hc`X]gd`Umcf`\]XY`U`Z`Y`X"
'": Hc`g\ck`Ub`]bj`]g]V`Y`Z`Y`Xž`gY`YW8`h`Y`Z`Y`X`hc`X]gd`Um`UbX`gY`YW8`G\ck"
(": Hc`\]XY`U`j`]g]V`Y`Z`Y`Xž`gY`YW8`h`Y`Z`Y`X`hc`\]XY`UbX`gY`YW8<]XY"
)": Hc`W`Ub[Y`h`Y`cfXYf`cZ`Z`Y`Xg`g\ck`b`cb`h`Y`gdfYUXg\YYhž`gY`YW8`h`Y`Z`Y`X`hc`a`cj`Y`
]b`h`Y`:]Y`Xg`@gh`Vcl`UbX`gY`YW8`Y]h`Y`Dfca`ch`Y`cf`8`Ya`ch`Y"
*": GY`YW8`YZUi`h`hc`]gh`h`Y`XY`ZUi`h`Z`Y`Xg`Ug`J`]g]V`Y`:]Y`Xg"
+": GY`YW8`h`Y`@cW`YX`7`c`i`a`bg`Vcl`UbX`YbhYf`h`Y`bi`a`VYf`cZ`W`i`a`bg`hc`cW`]b`
d`UW`H`Y`W`i`a`bg`UfY`bi`a`VYfYX`Z`fca`h`cd`hc`Vch`hca`i`bXYf`j`]g]V`Y`Z`Y`Xg`K`Yb`
U`W`i`a`b`]g`cW`YXž`]h`k`]`b`ch`W`Ub[Y`dcg]h`cb`]b`h`Y`gdfYUXg\YYh`

Configuring Font

%" GY`YW[: cbh`hc `WUb[Y`h\Y`Zcbh`bUa Y\z ghmY\z g]nY\z UbX`W`cf" H\Y` : cbh`
WbZ[i fUh]cb`gWYYb`k]``UddYUf"

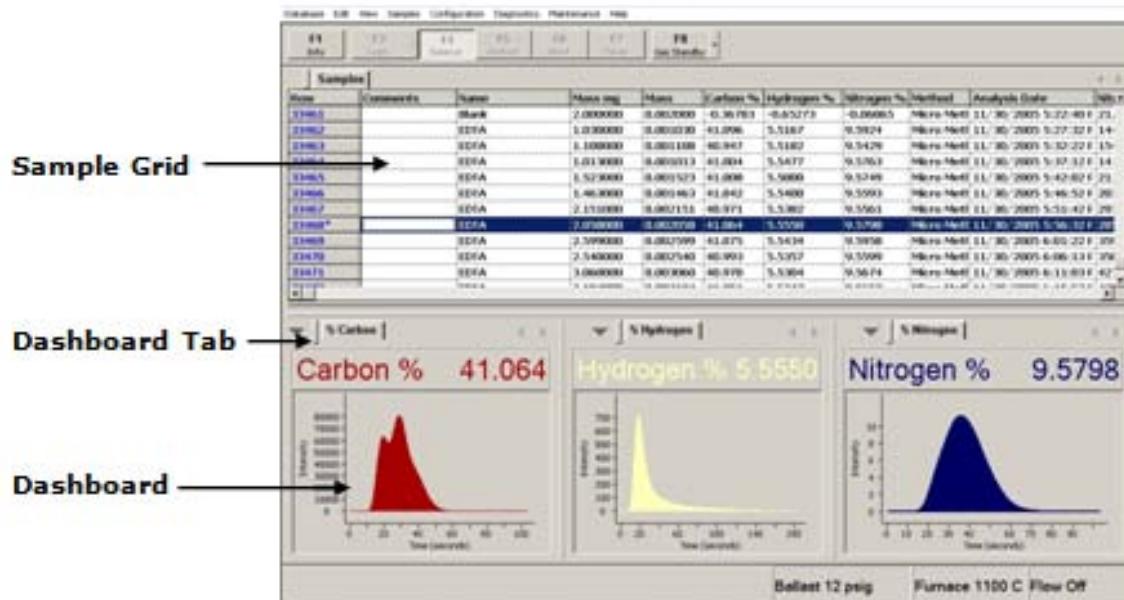


&" : fca`h\Y` : cbh`WbZ[i fUh]cb`gWYYb`gY`YW[h\Y` : cbh`B Ua Y\z GhmY\z UbX`G]nY" 5`
gUa d`Y`cZ`h\Y`gY`YW[YX` : cbh`k]``UddYUf`]b`h\Y`GUa d`Y`HYI`h`dfYj`]Yk`Vcl "

Creating a Dashboard Panel

H\Y'8Ug\`VcUfX'DUbY`'Wb`X]gd`UmUb`Y`Ya Ybh'd`chcf`Y`Ya Ybhj U'i Yg"FYZYf'hc`
G]b[`Y`GUa d`Y`GY`YVWYXždU[Y` (E&)"

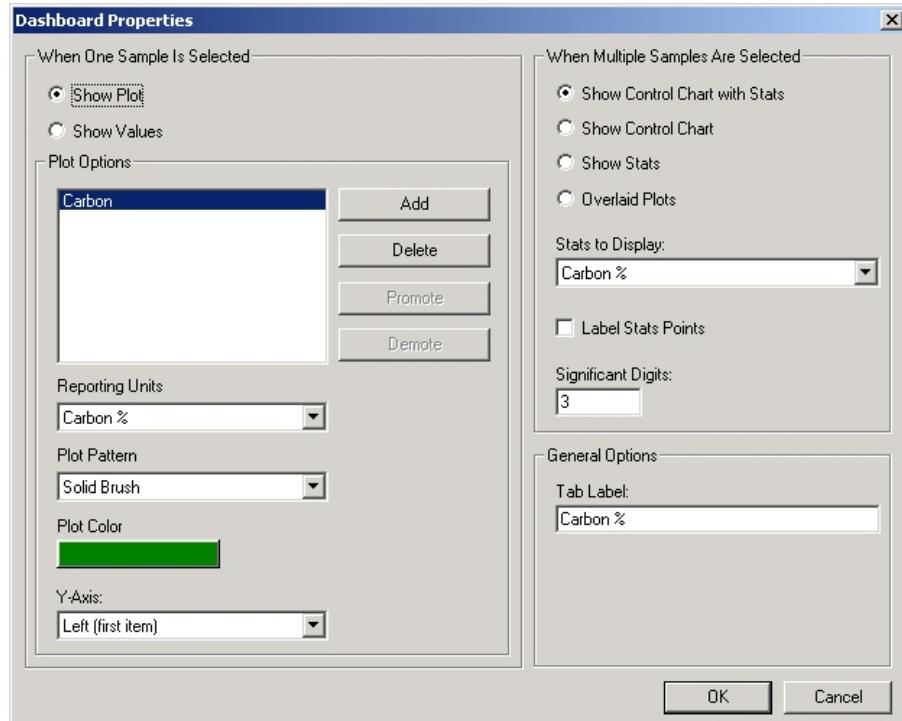
H\Y'XUg\`VcUfX`X]gd`Um'k`]]`Ui hca Uh]W`mW Ub[Y`XYdYbX]b[`cb`h\Y`bi a VYf`cZ
gUa d`Yg`gY`YVWYX`FYZYf'hc`A i`h]d`Y`GUa d`Yg`GY`YVWYXždU[Y` (E&+)"



Single Sample Selected

Showing an Element Plot in the Dashboard

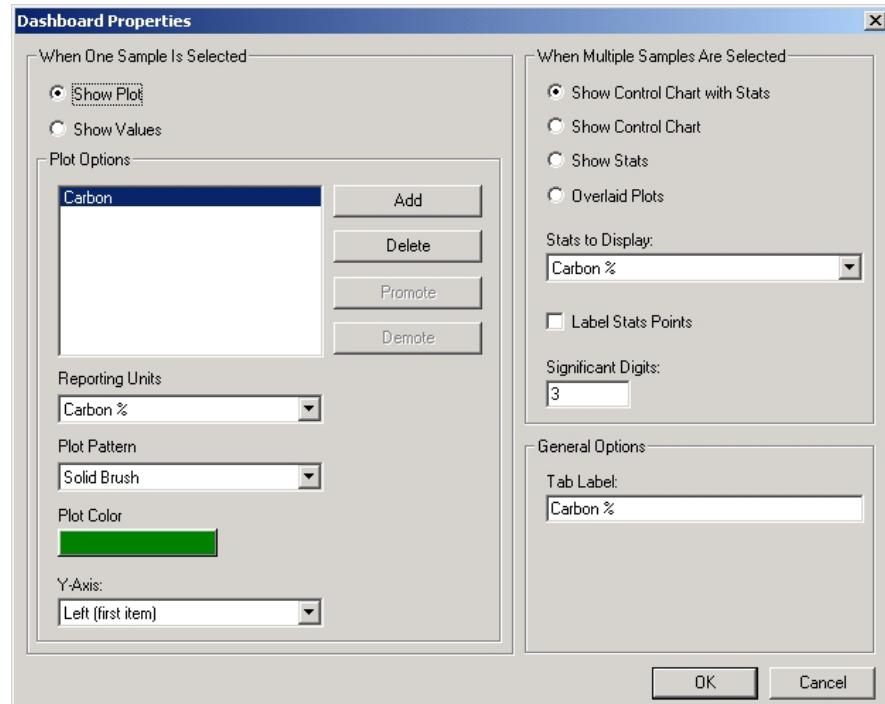
%": fca 'h Y J]Yk 'a Ybi z gY`YWiBYk '8Ug\ VcUfX'DUbY"·5'bYk 'XUg\ VcUfX'k]``VY'WYUhYX'UbX'h Y'XUg\ VcUfX'WtbZ[i fUh]cb'X]Uc['Vcl 'k]``UddYUf"



&": GY`YWiG\ck 'Dch]cb'h Y'YZig]XY'cZhY'gWYYb"
 '": GY`YWi5XX'jb'h Y'Dch'Cdh]cbg'X]Uc['Vcl "·5'']ghcZY'Ya Ybh'k]``UddYUf"·GY`YWi h Y'Y'Ya Ybh'hc'd'ch'UbX'gY`YWiC?"·5'bYk 'd'ch'k]``UddYUf"
 (": GY`YWi h Y'Xfc! Xck b'Uffck 'UbX'gY`YWi h Y'FYdcfh]b['l b]hg'Zcf'h Y'Y'Ya Ybh'hc'd'ch"
)": GY`YWi h Y'Xfc! Xck b'Uffck 'UbX'gY`YWi h Y'D'ch'DUhhYfb"
 *": GY`YWi D'ch'7c`cf'UbX'gY`YWi h Y'XYg]fYX'd'ch'Wt`cf"
 +"": GY`YWi M5I]g'hc'gY`YWi h Y'M5I]g'hc'X]gd'Um'·GY`YWi cbg.'BcbYz@Yzh'cf'6ch"
 ,": GY`YWi C?'hc'gUj Y'h Y'XUg\ VcUfX'WtbZ[i fUh]cb"

Showing Element Values in the Dashboard

%": fca 'h\Y' J]Yk 'a Ybi ž gY`Y\W\BYk '8Ug\ VcUfX'DUbY'"'5'bYk 'XUg\ VcUfX'k]``'VY'W\YUhYX'UbX'h\Y'XUg\ VcUfX'W\Z[i fUh]cb 'X]U'c['Vcl 'k]``'UddYUf"



&": GY`Y\W\G\ck 'J U'i Yg'cb 'h\Y'Y\Z[g]XY'cZ'h\Y'g\WYYb"

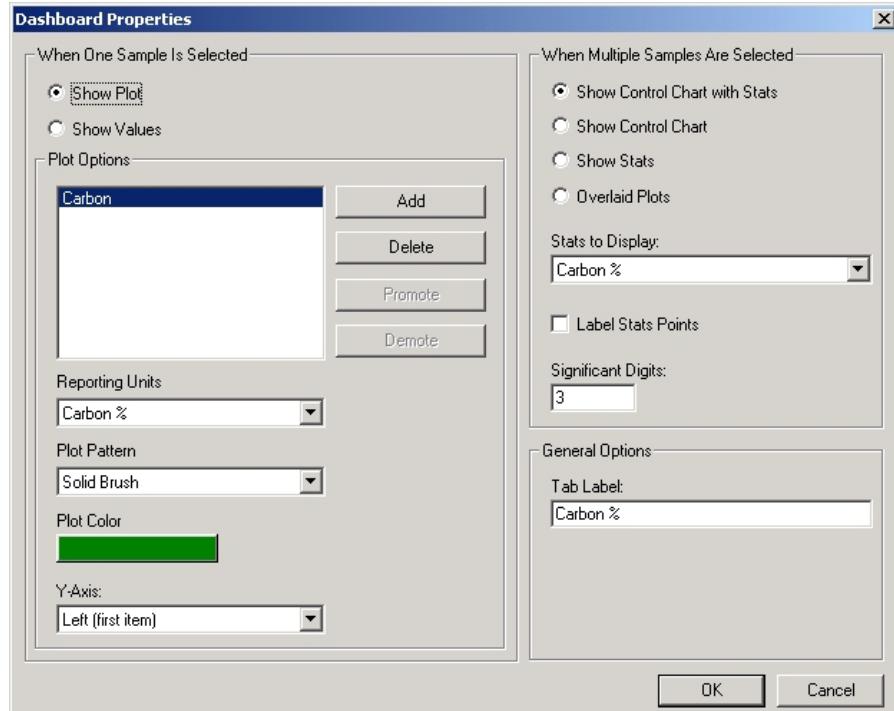
'": GY`Y\W\ C? 'hc'gUj Y'h\Y'XUg\ VcUfX'W\Z[i fUh]cb"

Dashboard Tab Label

GY`Y\W\]bg]XY'h\Y'HUV'@UVY'YX]h\Vcl 'UbX'Yb\Yf'U'bUa Y'h\Uh'k]``'UddYUf'jb 'h\Y'UV'Zcf' h\Y'W\YUhYX'XUg\ VcUfX"

Multiple Samples Selected

%": fca 'h Y J]Yk 'a Ybi žgY'YVWBYk '8Ug\ VcUfX'DUbY'"5'bYk 'XUg\ VcUfX'k]``'VY'WYUhYX'UbX'h Y'XUg\ VcUfX'WbZ[i fUh]cb 'X]U'c['Vcl 'k]``'UddYUf"



& I gY'h Y'X]U'c['Vcl 'cb 'h Y'f][\h h'gY'YVW'h Y']bZfa Uh]cb 'g\ck b ']b 'h Y'XUg\ VcUfX''GY'YVW]cbg'UfY.'

Control Chart with Statistics—5'WUfhk]h d'chhYX'gUa d'Y'j U'i Yg'jb'UXX]h]cb 'h'Y'Uj YfU[Y'j U'i Yž'ghUbXUfX'XYj]Uh]cbž'fY'Uhj Y'ghUbXUfX'XYj]Uh]cb'UbX'h Y'bi a VYf'cZgUa d'Yg'gY'YVWYX''

Control Chart—5'WUfhk]h d'chhYX'gUa d'Y'j U'i Yg''

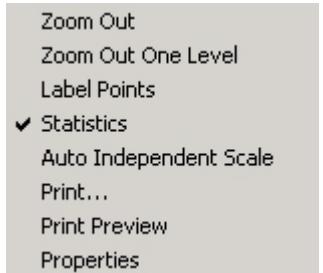
Statistics—h Y'Uj YfU[Y'j U'i Yž'ghUbXUfX'XYj]Uh]cbž'fY'Uhj Y'ghUbXUfX'XYj]Uh]cb'UbX'h Y'bi a VYf'cZgUa d'Yg'gY'YVWYX''

Overlaid Plots—D'chg'cZYUW'gY'YVWYX'gUa d'Y'jb 'h Y'gUa Y'XUg\ VcUfX''

- ' " GY'YVW'h Y'Xfc! Xck b 'Uffck ']b 'h Y'GhUhg'hc '8]gd'UmigY'YVW]cb 'Vcl 'UbX'gY'YVW'h Y'XYg]fYX'ghUh]gh]W'g\ck b ']b 'h Y'XUg\ VcUfX''
- (" GY'YVW'h Y'@UVY'GhUhg'Dc]bhg'W'YVW]Vcl 'hc 'UVY' h Y'gUa d'Y'dc]bhg'cb 'h Y'W'Ufh' 'h Y'bi a VYfg' h Uh'UddYUf'k]h 'h Y'dc]bh'UfY' h Y'gUa d'Y'bi a VYfg'gY'YVWYX''
-) " GY'YVW]bg]XY'h Y'G][b]Z]W'bh'8][]hg'gY'YVW]cb 'Vcl 'hc 'gY'YVW'h Y'gUh]gh]W'bi a VYf'Zcfa Uh''

Configuring the Dashboard

Hc 'WtcbZ[i fY'h\Y'XUg\ VcUfXž'f][\h\W]W'cb 'h\Y'XUg\ VcUfX'hc 'X]gd'Umh\Y'WtcbZ[i fUh]cb 'a Ybi ".



Zoom—Dcgjh]cb 'h\Y'a ci gY'Wfgcf'cj Yf'h\Y'UfYU'cZU'd'ch'hc'ncca 'jb'"<c'X'h\Y'Yzh'a ci gY'Vi h\cb'jb'UbX'XfUk 'U'Vcl "'h\Y'UfYU'bg]XY'h\Y'Vcl 'k]``VY'a U[b]ZYX''8fUk 'Ubch'Yf'Vcl 'hc'ncca 'jb'ZUfh'Yf''GY'YWh'Ncca 'Ci h'CbY'@j Y'hc'fYXi W'h\Y'a U[b]ZYWh]cb 'VmcbY'Yj Y'''GY'YWh'Ncca 'Ci h'hc'ncca 'ci h'U'''Yj Y'g'UbX'fYh'fb 'hc'h\Y'cf][]bU'd'ch".

Label Points—@UVY'dc]bhg'k]``d'UW'h\Y'gUa d'Y'bi a VYf'bYUf'h\Y'dc]bh'cb'U'Wtbfcc'W'Ufh'GY'YWh'a i 'h]d'Y'gUa d'Yg" F][\h\W]W'h\Y'XYg]fYX'XUg\ VcUfX'UbX'gY'YWh'@UVY'Dc]bhg".

Statistics—GHUjhghW'k]``X]gd'Um'U'Wtbfcc'W'Ufhcf'a i 'h]d'Y'd'chg"GY'YWh'a i 'h]d'Y'gUa d'Yg"GY'YWh'jhjhW'hc'X]gd'Um'U'Wtbfcc'W'Ufh'8YgY'YWh'jhjhW'hc'X]gd'Um'a i 'h]d'Y'd'chg".

Auto Independent Scale—K \Yb'a i 'h]d'Y'gY'YWh'X'd'chg'UfY'gW'YX'X]ZYfYbhñž 5i hc'=bXYdYbXYbh'GW'Y'fYgW'Yg'h\Y'd'chg'gc'h\YmWb'VY'W'a dUfYX'hc[Yh'Yf'GY'YWh'5i hc'=bXYdYbXYbh'GW'Y'hc'fYgW'Y'd'chg".

Properties—8]gd'Ung'h\Y'8Ug\ VcUfX'Dfcdfh]Yg'X]U'c['Vcl 'Zcf'UXj UbW'X'WtcbZ[i fUh]cb 'cf'W'Ujh]cb 'cZU'bYk 'XUg\ VcUfX'FYZYf'hc'7fYUjh]b['U'8Ug\ VcUfX'DUbY'ž dU[Y' (É&)"

Position a Dashboard

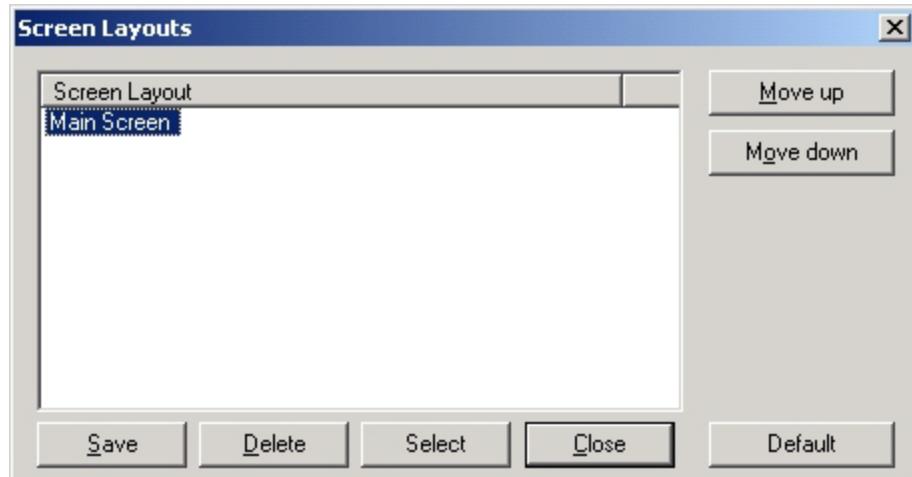
A cj Y'h\Y'a ci gY'dc]bhYf'cj Yf'h\Y'XUg\ VcUfX'huV'UbX'\c'X'h\Y'Yzh'a ci gY'Vi h\cb'Xck b" A cj Y'h\Y'a ci gY'hc'dcgjh]cb 'h\Y'XUg\ VcUfX'cb 'h\Y'a U]b'gWYYb"

Hc 'g]nY'h\Y'XUg\ VcUfXž'a cj Y'h\Y'a ci gY'cj Yf'h\Y'gd']hYf'VUfg'UbX'\c'X'h\Y'Yzh'a ci gY'Vi h\cb'Xck b" A cj Y'h\Y'a ci gY'hc'a cj Y'h\Y'gd']hYf'VUfg"

FYZYf'hc'A U]b'GWWYYb'Cj Yfj]Yk ž dU[Y' (É&%")

Screen Layouts

5ZhYf h\Y GUa d`Y'; f]X'UbX'8Ug\ VcUfX'UfY'W\ebZ][i fYXž h\Y m\Wb 'VY'gUj Y'Ug'U'Umci h' 6mgUj]b['h\Y'Umci h\mci 'UfY'U'k Umgi Uggi fYX'mci 'W\Wb'fYghcfY'h\Y'W\ebZ][i fUh]cb 'Z]h]g' `cgH''
 %" 7cbZ][i fY'h\Y'a U]b'gW\YYb'Ug'XYg]fYX" FYZf'h\c'8]gd'Um7cbZ][i fUh]cb'z'dU[Y' (E&%)
 &" GY'Y\W\h\Y'J]Yk 'a Ybi 'UbX'h\Yb'gY'Y\W\G\W\YYb '@Umci hg' 'h\Y'G\W\YYb '@Umci hg' G\W\YYb'k]' UddYUf"



" " GY'Y\W\GUj Y'UbX'YbhYf'U'i b]ei Y'bUa Y'Zcf'h\Y'WffYbhgW\YYb'Umci h'
 (" " GY'Y\W\7'cgY'h\c'Yk]h'UbX'gUj Y'h\Y'gW\YYb'Umci h"

Move—GY'Y\W\U'gW\YYb'Umci h'UbX'gY'Y\W\A cj Y'I d'cf'A cj Y'8ck b'h\c'a cj Y'U'gY'Y\W\YX' gW\YYb'Umci h'i d'cf'Xck b'h\Y'']gh"

Delete—GY'Y\W\U'gW\YYb'Umci h'UbX'gY'Y\W\8YYhY'h\c'fYa cj Y'U'gW\YYb'Umci h'Zfc a 'h\Y']gh" 5ZhYf'U'gW\YYb'Umci h'\Ug'VYYb'fYa cj YX']h'W\bbch'VY'fYghcfYX"

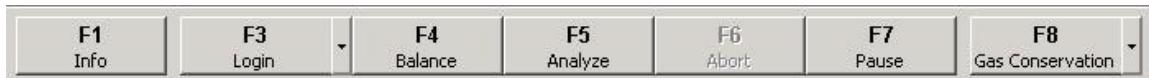
Select—DYfa]hg'h\Y'cdYfUhcf'h\c'gY'Y\W\U'bYk 'gW\YYb'Umci h'<][\][\h\h\Y'XYg]fYX' gW\YYb'Umci h'UbX'\WccgY'G\Y'Y\W\7'cgY'h\c'YI]h"

Close—GY'Y\W\7'cgY'h\c'YI]hgW\YYb'Umci hg"

Default—GY'Y\W\8YZJi 'h\h\c'fYh fb'h\Y'ZUWcfmXYZJi 'hgW\YYb'GY'Y\W\7'cgY'h\c'YI]h"

Hide/Show the Toolbar

=Z'XYg]fYXž'h\Y'hcc'VUf'W\Wb'VY'h\fbYX'CZZcf'h\fbYX'VUW_Cb'"h\Y'hcc'VUfž'cW\hYX'Uh' h\Y'hcd'cZ'h\Y'gW\YYbž]g'U'ei]W'k Umhc'dYfZfc a Ybi 'Z'bW\cbg'k]h'ci h'UW\gg]b['h\Y'a Ybi g'" : fca 'h\Y'J]Yk 'a Ybi ž'gY'Y\W\Hcc'VUf"5'W\Y\W'jbX]W\hYg'h\Y'hcc'VUf'k]'VY'X]gd'UmYX"



Hide/Show the Status Bar

=Z'XYg]fYXž`h\Y`ghUh\ g`VUF`W\`b`VY`hi fbYX`CZ`cf`hi fbYX`VUW`C`b``H\Y`ghUh\ g`VUFž`c`W\hYX`U`h\Y`Vchca`cZ`h\Y`gW\YYbž`k]``g\ck`cdYfUh]cbU`Z`bW\cbg`cZ`h\Y`]bgfhi a`Ybh`Ug`h\Ym`UfY`W`ffYbh\m]b`dfc[fYgg"

: fca`h\Y`J`]Yk`a`Ybi`ž`gY`Y\W\GhUh\ g`6Uf``5`W\Y\W`]bX]W\hYg`h\Y`ghUh\ g`VUF`k]``VY`X]gd`Um`YX``



Log Bar

H\Y`c[`VUFž`c`W\hYX`U`h\Y`Vchca`cZ`h\Y`gW\YYbž`X]gd`Um\g`]bZcfa`Uh]cb`gUj`YX`]b`h\Y`c[`Z`Y``h`cb`m`Udd`YUfg`k`Yb`]h]X]gd`Um\g`]bZcfa`Uh]cb``H\]g`]bZcfa`Uh]cb`a`Um`VY`W\`a`a`b]W\h]cb`ZU`]i`fYgž`gYj`YfY`Yffcfg`cf`cdYfUh]cbU`dfc`W\Xi`fYg``

=Z@C[`6Uf`]g`bch`W\Y\W\YXž`]h\k]``cb`m`X]gd`Um`W\`a`a`i`b]W\h]cbg`ZU`]i`fYg`UbX`gYj`YfY`Yffcfg``

=Z@C[`6Uf`]g`W\Y\W\YXž`]h\k]``X]gd`Um`U`b`m]bZcfa`Uh]cb`gUj`YX`]b`h\Y`c[`Z`Y``H\]g`]bW\XYg`W\`a`a`i`b]W\h]cbg`ZU`]i`fYgž`gYj`YfY`Yffcfg`UbX`cdYfUh]cbU`dfc`W\Xi`fYg``

9I`Ua`d`Yg`cZ`cdYfUh]cbU`dfc`W\Xi`fYg`UfY`gUa`d`Y`XUhJ`W\`Ub`[Ygž`W\`]VfUh]cb`W\`Ub`[Ygž`W\`Ub`[Y`h\`h\Y`gUa`d`Y`a`Uggž`UbX`a`cfY``

Shortcuts to Move Between Samples

Go to First Row in the Spreadsheet

H\Y`Z]fgh`fck`]b`h\Y`gdfYUXg\YYh`W\`b`VY`ei`]W`mgY`Y\W\YX``

%`` : fca`h\Y`J`]Yk`a`Ybi`ž`gY`Y\W\@Ugh`Fck``

&`` H\Y`W`fgcf`k]``Ui`hca`Uh]W\`m\`a`d`h\`h\Y`Z]fgh`fck``

Go to Last Row in the Spreadsheet

H\Y`Ugh`fck`]b`h\Y`gdfYUXg\YYh`W\`b`VY`ei`]W`mgY`Y\W\YX``

%`` : fca`h\Y`J`]Yk`a`Ybi`ž`gY`Y\W\@Ugh`Fck``

&`` H\Y`W`fgcf`k]``Ui`hca`Uh]W\`m\`a`d`h\`h\Y`Ugh`fck``

Go to Analyze Row in the Spreadsheet

H\Y`UbU`mY`fck`]g`h\Y`fck`]b`h\Y`gdfYUXg\YYh`h\U`h\W\`bH\]bg`h\Y`bYl`h\gUa`d`Y`h\`VY`UbU`mYX``H\]g`fck`W\`b`VY`ei`]W`mgY`Y\W\YX``

%`` : fca`h\Y`J`]Yk`a`Ybi`ž`gY`Y\W\5bU`mY`Fck``

&`` H\Y`W`fgcf`k]``Ui`hca`Uh]W\`m\`a`d`h\`h\Y`UbU`mY`fck``

Auto Widths

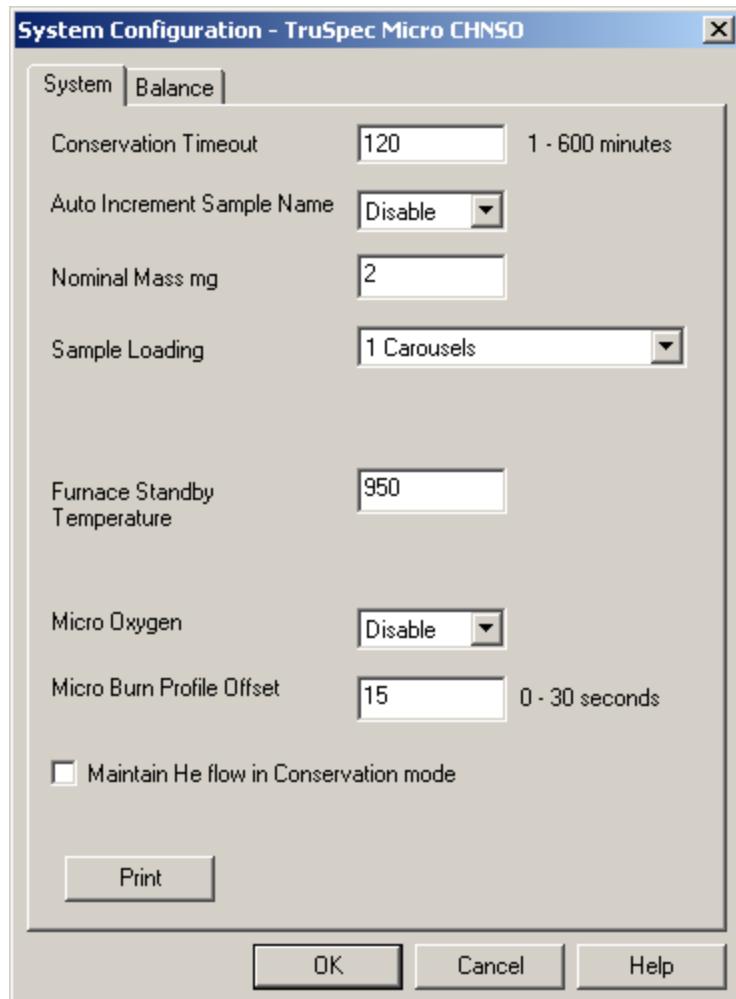
%`` GY`Y\W\h\Y`7cbZ[i`fUh]cb`a`Ybi`

&`` GY`Y\W\5i`h\`K`]Xh\`g\`h\`UX\`gh\`h\`Y`g]nY`cZYUW\`W\``]b`h\Y`gUa`d`Y`X]gd`Um\`h\`Z\`h\`h\Y`h\`h\`h\`bg]XY`h\`h\`Y`W\``

System Configuration

GmghYa 'WtbZ[i fUh]cb 'dYfa]hg'h Y'cdYfUhcf 'hc 'gYh'h Y'cj YfU'`]bghfi a Ybh'cdYfUh]b[' gYh]b[g'UbX'dUfUa YhYf'j U'i Yg'Zcf'U'XYg]fYX'Udd']Wjh]cb"

%" : fca 'h Y'7cbZ[i fUh]cb 'a Ybi žgY'YWh GmghYa "H\Y'GmghYa '7cbZ[i fUh]cb 'X]U'c[' Vcl 'k]`'UddYUf"



&" GYh'h Y'gmghYa 'dUfUa YhYfg'i g]b['h Y'XYZUj 'h]j U'i Yg'Ug'U'[YbYfU'`[i]XY]bY'"
GdYWhU'`gYh]b[g'Zcf'WfhU]b 'Udd']Wjh]cbg'a UmVY'YbhYfYX'Uh'h]g'dc]bh'FYZYf'hc'
GmghYa '7cbZ[i fUh]cb '8YZ]b]h]cbgž'dU[Y'(E' &ž Zcf'gYh]b['UbX'dUfUa YhYf'j U'i Yg'"
' " 5ZhYf'YbhYf]b['U'`]bZcfa Uh]cbž'gY'YWh C?"

System Configuration Definitions

Gas Conservation Timeout—*H\Y\h]a Y]b a]bi hYg\z UZhYf UbU\mg]g\z k \Yb\h\Y\]bghfi a Ybh\Ui hca Uh\W\`migk]h\W\Yg\h\c\h\Y[Ug\W\bgYfj Uh\cb a cXY\`F Ub[Y. \%h\c* \$\$\%8YZJi\h\% a]bi hYg"*

Auto Increment Sample Name—*K \Yb\YbUV\YXz]Z\h\Y\Z]Y\`bUa Y\YbXg\k]h\`U\` bi a VYf\z]h\k]``]b\W\Ya Ybh\Y\Yj Yfm\h]a Y\U\`bYk\`gUa d\Y\`g\`c[[YX\`b\`*

Nominal Mass—*H\Y\`a Ugg\j U\`i Y\h\`Uh\k]``]Ui hca Uh\W\`mUddYUf\`Xi f]b[``c[]b\` Hm\]W\`n\`h\Y\`V\`Ub_`a Ugg\j U\`i Y\`g\`&\\$`a [``*

Sample Loading—*DYfa]h\h\Y\cdYfUhcf\h\c\`gY\Y\W\`ck\`gUa d\Yg\UfY\`cUXYX\`bhc\h\Y\ XYh\Yfa]bUhcf\`H\Y\Z\`ck]b[\`gY\Y\W\`cb\`g\`Uj\`U\`UV\`Y\`*

- **Carousels**—*7Ufc\`gY\g\`g\`ci\`X\`VY\`gY\Y\W\`YX\`Z\h\Y\`Ui h\c\`cUXYf\`f\W\`fc\`gY\`L\`g\`i\`gY\`G\`Y\Y\W\`h\Y\`bi a VYf\`c\`Z\W\`fc\`gY\`g\`]b\`i\`gY\`G\`Y\Y\W\`cb\`g\`&\\$`h\`fc\`i\`l\`(``*

Furnace Standby Temperature—*GY\Y\W\`h\Y\`W\`a Vi gh\cb\`Z\`fbUW\`h\Y\`dYfUh\`fY\`Xi f]b[\`[Ug\W\bgYfj Uh\cb\`F Ub[Y\`*) \\$\`h\`-) \\$\\$7\`FYX\`Vi W\`b[\`h\Y\`Z\`fbUW\`h\Y\`dYfUh\`fY\`Xi f]b[\`gh\`UbXVm\k]``]b\W\`YUgY\h\Y\`Z\`Y\`cZ\h\Y\`W\`a Vi gh\cb\`Z\`fbUW\`UbX\`Ugg\`W\`h\Y\`W\`a dc\`bYbh\``*

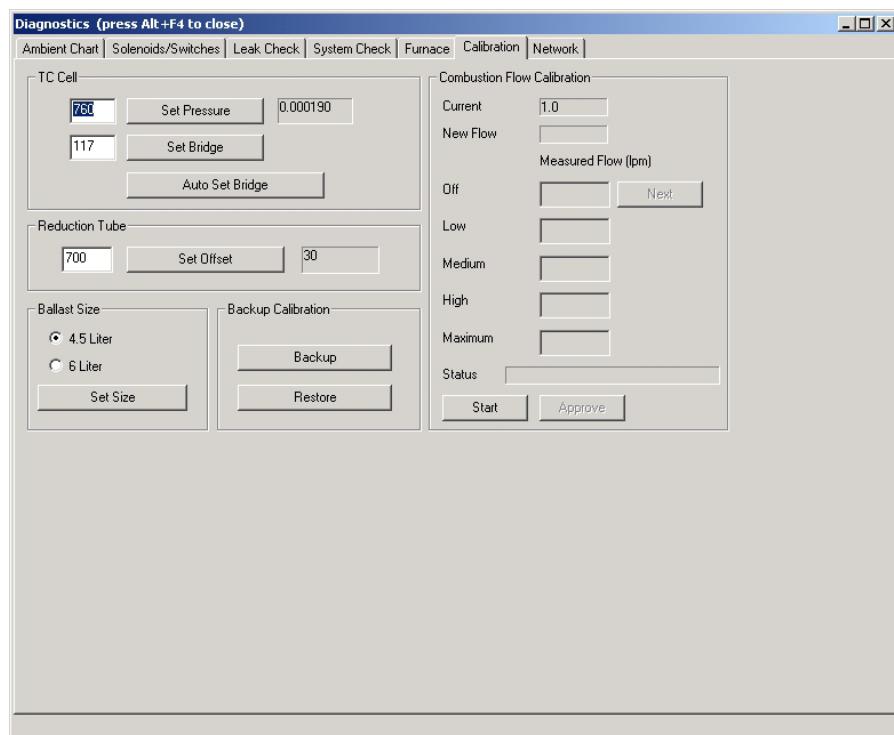
Micro Burn Profile Offset—*DYfa]hg\`cl m[Yb\h\c\`VY\`h\`fbYX\`cb\`VYZcfY\h\Y\`gUa d\Y\`Xfcdg\`bhc\h\Y\`Z\`fbUW\`G\`Y\Y\W\`cb\`\$`h\`\\$`gY\W\`bXg\`8YZJi\h\%`gY\W\`bXg\`*

Maintain Helium Flow in Conservation Mode—*DYfa]hg\`h\Y\`Y\`j\`a\`[Ug\`h\c\`VY\`Y\`Z\`cb\`k\`Yb\h\Y\`XYh\Yfa]bUhcf\`gk\`h\W\`Yg\h\c\h\Y[Ug\W\bgYfj Uh\cb a cXY\`*

Print—*GY\Y\W\`Df\`bh\h\c\`fY\W\`] Y\U\`df\`bhci\`h\c\`Z\h\Y\`gngh\`Ya\`W\`bZ\`[i\`fUh\cb\`gY\`h\`b[g\`Z\`ca\`h\Y\`gngh\`Ya\`df\`bh\Y\`f\`H\`Yg\`a Um\`VY\`gUj\`YX\`Zcf\`Z\`h\`fY\`fYZfYb\W\``*

Calibrating Barometric Pressure for TC Cell

6Ufca Yhf]W7U]VfUh]cb gYhg'hY]bghfi a Ybhf]VUfca YhYf'hc'hY'WffYbh]VUfca Yhf]W dfYggi fY' 5b'UWWfUhYz'cW'z'VUfca Yhf]WdfYggi fY'j U'i Y'a i gh'VY'Uj U]UVY'hc'dYfZfa hJg'dfcWXXi fY'FYZYf'hc' 6Ufca Yhf]WdfYggi fY'z'dU[Y'+E+z'Zcf'UXX]hcbU'jbZcfa Uh]cb'' 7\Ub[Yg]b'VUfca Yhf]WdfYggi fY'k]``UZZYWh[Ug]j c'i a Y': cf'hc]g'fYUgcbz'hY'WffYWh VUfca Yhf]WdfYggi fY'a i gh'VY'a Ubi U'mYbhYfYX'hc'cVhU]b'hY'a cgh'UWWfUhY'fYgi 'hg'" %" Hi fb'CZZhY'\Y]jia'[Ug'Uh'hY]bghfi a Ybh'' &" FYa cj Y'hY]bWta]b['\Y]jia'gWhi VVYf'hi VY'' '+' : fca'hY'8]U[bcgh]Wa Ybi z'gYYWh7U]VfUh]cb''HhY<UfXk UfY'7U]VfUh]cb'X]Uc[Vcl'k]``UddYUf''



(" 9bhYf'hY'WffYbh]VUfca Yhf]WdfYggi fY']b'hY'YX]h'Vcl'hc'hY'YZh'cZGYh'DfYggi fY']b'hY'H7'7Y'Vcl ''

NOTE → I gY'j U'i Yg]b'a a '<['Zcf'VUfca Yhf]WdfYggi fY''

) " GY'YWhGYh'DfYggi fY'hc'gYh'hY'dfYggi fY'YbhYfYX]b'hY'YX]h'Vcl ''

* " 7'cgY'hY'<UfXk UfY'7U]VfUh]cb'X]Uc['Vcl'hc'YI]h'h]g'dfcWXXi fY'UbX'gUj Y'hY' gYh]b[''

+ " FY]bghU''hY]bWta]b['\Y]jia'gWhi VVYf'hi VY''

, " Hi fb'Cb'hY'\Y]jia'[Ug'Uh'hY]bghfi a Ybh''

Remote Communication

F Ya chY' Wta a i b]WWh]cb]bW XYg'h Y' fYa chY' gUa d'Y' c[]b' cdh]cbz'h Y' fYa chY' Wbhfc' cdh]cbz' UbX' XUhU' hfUbga]h' H YgY' gcZhk UfY' cdh]cbg' UfY' Zci bX' cb' gYYW@97C' dfcXi Wg' i gYX' hc' YbUVY' h Y' f]b' WfdcfUjh]cb']b' Ub' Ui' hca UhYX' Ybj']fcba Ybh' H YmWb' VY' i gYX' hc' Wbhfc' h Y']bghfi a Ybh' Zfc a U' fYa chY' cWWh]cb' j']U' U' F& & cf' BYh' cf_]bhYfZUW' UbX#cf' hc' fYVW]j' Y' XUhU' Zfc a h Y']bghfi a Ybh''

F Ya chY' gUa d'Y' c[]b' U' ck g' U' fYa chY' Wta di hYf' hc' c[]b' i bUbU'mYX' gUa d'Yg' k \]Y' h Y' cWWh' Wta di hYf' fYH]bg' Wbhfc' "F Ya chY' Wbhfc' U' ck g' U' fYa chY' Wta di hYf' hc' Wbhfc' h Y']bghfi a Ybh' VmH]b' ['cj Yf' h Y' cWWh' Wta di hYf' gc' h Y' Uh' cb' mWta a UbXg' Zfc a h Y' fYa chY' Wta di hYf' UfY' gYbh' hc' h Y']bghfi a Ybh' 8UhU' hfUbga]h' U' ck g' gUa d'Y' XUhU' hc' VY' hfUbga]hYX' hc' U' fYa chY' Wta di hYf' : cf' Z fH' Yf']bZfc a Uh]cb' UbX']bghfi W]cbg' fYZf' hc' F Ya chY' GUa d'Y' @c[]b' F Ya chY' 7cbhfc' z' 8UhU' hfUbga]h' UbX' 5bU' mg' g' F Ygi' hg' VY[]bb]b['cb' dU[Y' (E')"

8UhU' hfUbga]h' bYYXg' Uh' YUgh' b]! X]fYVW]cbU' Wta a i b]WWh]cb' Zfc a h Y' cWWh' Wta di hYf' hc' h Y' fYa chY' Wta di hYf' "

F Ya chY' gUa d'Y' c[]b' UbX' fYa chY' Wbhfc' Wta a i b]WWh]cb']h' h Y' cWWh' Wta di hYf' j']U' U' V]! X]fYVW]cbU' Wta a i b]WWh]cb' dfchcW' i' g]b['LA @Wta a UbXg' h Y' fYa chY' Wta di hYf' YI' Wk' Ub[Yg' Wta a UbXg' UbX' XUhU' k']h' U' fYa chY' Wta di hYf' j']U' U' gYf]U' dcfh' cf' bYh' cf_ WbbYWh]cb' H Y' gYf]U' dcfh' g' WbZ[i' fUVY' k']h' fYgdYWh' hc' h Y' dcfh' vui X' fUhYz' dUf]hm' YhW' H Y' bYh' cf_ WbbYWh]cb' g' U' H7D#-D' ghfYUa' k']h' U' WbZ[i' fUVY' dcfh' "

H Y' fYa chY' Wta di hYf' gYbXg' Wta a UbXg' hc' h Y' cWWh' Wta di hYf' UbX' h Y' cWWh' Wta di hYf' UW_bck' YX[Yg' h Y' Wta a UbXg' cf' fYH' fbgi' h Y' fYe' YghYX' XUhU' F Yh' fb' XUhU' k']' VY' jb' LA @Zfc a Uh' \ ck' Yj' Yf' gUa d'Y' fYgi' hg' UfY' fYh' fb' YX']b' h Y' Zfc a Uh' gdYWh]YX' Vm' h Y' WffYbh' XUhU' hfUbga]h' Zfc a Uh' cb' h Y' cWWh' Wta di hYf' =Zbc' XUhU' hfUbga]h' Zfc a Uh']g' XYZ]bYX' cb' h Y' cWWh' Wta di hYf' h Y' gcZhk' UfY' k']' fYh' fb' h Y' gUa d'Y']b' Zfc a Uh' cb' jb' LA @Zfc a Uh' Zfc' h Y' XUhU' ZY' Xg' WffYbh' mgdYWh]YX']b' h Y' gUa d'Y' [f]X' : cf' U']g' h' c' Z' Wta a UbXg' h Y' Wb' VY' gYbh' hc' h Y' cWWh' Wta di hYf' UbX' k' \ Uh' k']' VY' fYh' fb' YX' hc' h Y' fYa chY' Wta di hYf' fYZf' hc' LA @7ca a UbX' HUVYz' dU[Y' (E')"

H Y' hYi' hc' Z' h Y' Wta a UbXg' UbX' XUhU' Wb' VY']b' 5G7 =cf' l' b]WXY' UbX' UfY' Zfc a UhYX']b' L A @' H Y' LA @Zfc a Uh']g' U' k' UmicZ' H]U' []b['h Y' Wta a UbXg' UbX' XUhU' ZY' Xg']bg]XY' cZ' Ub['Y' VfuW' Yhg' f' Ygg' h' Ub' UbX' [fYUhf' f' h' Ub' g'] bgL' H Y' i' gY' cZ' gdUWg' h' Vg' z' Wff]U[Y' fYh' fbg' UbX']b' Y' ZYYXg' UfY' cdh]cbU' "

F Ya chY' Wbhfc' UbX' fYa chY' gUa d'Y' c[]b' UfY' df]a Uf]mi gYX' k']h' U' hca Uh]cb' gmghya' g' z' k' \]W' cUX' UbX' UbU'mY' gUa d'Yg' k']h' ci' h' cdYfUhcf']bdi' h' fYZf' hc' 5i' hca Uh]cbz' dU[Y' (E') \$"

Remote Sample Login

F Ya chY' GUa d'Y' @c[]b' A cXY' U' ck g' U' fYa chY' i' gYf' cb' U' fYa chY' Wta di hYf' hc' c[]b' gUa d'Yg' hc' VY' UbU'mYX' UbX' hc' W' YW' h Y' c] Yf' U' g' cZh' Y']bghfi a Ybh' H Y' cWWh' i' gYf' fi' bb]b['h Y']bghfi a Ybh' fYH]bg' Wbhfc' cZh' Y']bghfi a Ybh' UbX' Wb' UX' h Y' fYa chY' c[]b' gUa d'Yg' Zcf' UbU'mg' g' k' \ Yb' Wb]b' Yb]Ybh'

K']h' fYa chY' gUa d'Y' c[]b' h Y' cWWh' Wta di hYf' k']' ghcfY' g' gUa d'Y' XUhU']b' h Y' a dcfUfm' a Ya cfmiUg' h Y' gUa d'Y' XUhU' Uff]j' Yg' Zfc a h Y' fYa chY' Wta di hYf' i' bh' h Y' : ' Vi' h' cb' h Y' Hcc' VUf' g' gY' YW' YX' 5ZhYf' gY' YW']b[' z' h Y' gUa d'Y' XUhU' k']' VY' YbhYfYX']bhc' h Y' gdfYUXg' YYh'

Hc' YbUVY' h Y' fYa chY' gUa d'Y' c[]b' a cXY' Zfc a h Y' fYa chY' 7ca a i b]WWh]cb' cb' h Y' Gmghya' 7cbZ[i' fUh]cb' a Ybi' z' fYZf' hc' ghYd' , z' dU[Y' (E') +"

Remote Control

H\Y\fYa ch\Y\W\eb\hfc` a cXY\U\ck g\U\fYa ch\Y\i gYf\cb\U\fYa ch\Y\V\ta di h\Yf\hc\`c[`]b`
g\Ua d\Yg\hc\`VY\Ub\Um\YX\z\h\`V\Y\W\h\Y\cj YfU\`g\Uh\i g\cZ\h\Y\]bg\hfi a Yb\h\h\`c\`gh\Uf\h\Ub\`
Ub\Um\g\]g\z\Ub\X\h\`c\`W\eb\hfc\`h\Y\]bg\hfi a Yb\h\`=b\fYa ch\Y\W\eb\hfc` a cXY\z\h\Y\`c\W\i g\Yf\`a i g\h\`
f\Y\]bei]g\`W\eb\hfc\`c\Z\h\Y\]bg\hfi a Yb\h\`h\Y\gc\Z\h\k\Uf\Y\Xc\Yg\`b\ch\U\`ck\`h\Y\cd\Yf\U\h\cf\`h\`
]b\h\Yf\U\W\k\]h\`h\Y\gc\Z\h\k\Uf\Y\`=b\h\Yf\U\X\z\]h\fY\]Yg\`V\ta d\Yh\Y\mc\`U\fYa ch\Y\`V\ta di h\Yf\hc\`c[`]
]b\`g\Ua d\Yg\`Ub\X\]b\]h\]U\Y\h\Y\Ub\Um\g\]g\`H\Y\fYa ch\Y\W\eb\hfc` a cXY\]g\`U\W\j\`Y\cb\`m\k\`Yb\`h\Y\fYa ch\Y\W\eb\hfc` a cb\]h\cf\]g\`X\gd\`U\m\Y\X\`.

Hc\`Yb\UV\Y\h\Y\fYa ch\Y\W\eb\hfc` a cXY\z\g\Y\Y\W\`G\h\Uf\h\`F\Ya ch\Y\`cb\`h\Y\`7\cb\z\]i f\Uh\]cb\`a Ybi \`
cf\`cb\W\h\Y\`g\mg\h\Y\`a \`Ug\`V\Y\Yb\`W\eb\z\]i f\Y\X\`Z\cf\fYa ch\Y\`V\ta a i b\]W\h\]cb\`g\Y\Y\W\h\Y\`
9b\UV\Y\`F\Ya ch\Y\`7\cb\hfc\`cb\`G\h\Uf\h\`d\`V\Y\Y\W\`V\cl\`Z\ca\`h\Y\`F\Ya ch\Y\`7\ca a i b\]W\h\]cb\`h\U\`cb\`
h\Y\`G\mg\h\Y\`a \`7\cb\z\]i f\Uh\]cb\`a Ybi \`F\Y\Z\f\`h\`g\h\Y\`d\` \`d\U[Y\`(\`E\` +\`]

Data Transmit

8\Uh\`h\Uf\U\bg\]h\`a cXY\U\ck g\`g\Ua d\Y\X\Uh\`h\`c\`VY\`g\Yb\h\`h\`U\fYa ch\Y\`V\ta di h\Yf\`V\m\`
h\Uf\U\bg\]h\]b\`g\Ua d\Y\fY\gi\`h\`g\]b\`U\`df\Y\!XY\Z\]b\Y\X\f\`Mi h\W\eb\z\]i f\U\`Y\`Z\fa\`Uh\`h\`U\fYa ch\Y\`
`V\ta di h\Yf\`h\Y\`h\Uf\U\bg\]gg\]cb\`c\W\`f\`g\`i d\cb\`cd\Yf\U\h\cf\`g\Y\Y\W\`cb\`c\Z\U\`a Ybi \`V\ta a Ub\X\`Ub\X\z\`
Ug\`Ub\`cd\h\]cb\`Ui h\`a Uh\W\`m\Uh\`h\Y\`V\ta d\Yh\]cb\`c\Z\Y\U\W\`Ub\Um\g\]g\`F\Y\Z\f\`h\` - \`d\U[Y\`(\`E\` +\`].

NOTE →

H\Y\`g\cZ\h\k\Uf\Y\Xc\Yg\`b\ch\f\`Y\`e\`i\`f\Y\`c\`f\`U\W\`V\`d\`h\`U\`b\`m\`V\ta a Ub\Xg\`c\`f\`X\Uh\`Z\fa\`h\Y\f\`Y\`a ch\Y\`
`V\ta di h\Yf\`.

Hc\`Yb\UV\Y\`X\Uh\`h\Uf\U\bg\]h\`W\Y\U\h\`U\`h\Uf\U\bg\]gg\]cb\`Z\fa\`Uh\`Ub\X\z\]Z\Uj\`U\`UV\Y\`g\Y\Y\W\`h\`
d\`U\W\`U\`v in the Enable Remote Communication checkbox. If remote communication
or remote sample login options have been registered, this checkbox is available.
Refer to steps 8-9, page 4-37. When this checkbox is available, the Use Remote
Communications Port checkbox on the Transmission Formats dialog box will be
available.

Analysis Results

Analysis results can be obtained in two ways for both the Remote Sample Login and the Remote Control modes.

- By sending the <Results> command.
- By configuring the software to transmit the results automatically at the end of each analysis.

Examples

Add a sample

```
<AddSample>
  <Name>Sample-ABC</Name>
  <Mass>0.997</Mass>
  <Method>Method-123</Method>
</Add Sample>
```

Start an analysis

```
<Analyze>
</Analyze>
```

Retrieve the analysis results

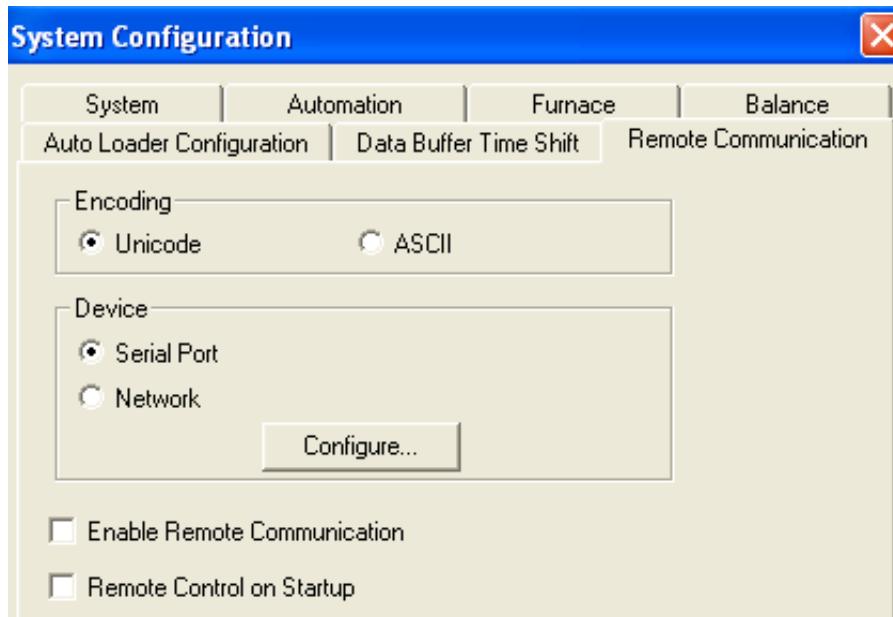
```
<Results>
</Results>
```

Delete results 100 days old or older

```
<DelResults>
  <Days>100</Days>
</DelResults>
```

Configure System for Remote Communication

1. Select Configuration on the Menu bar, and then select System.
2. On the System dialog box, select the Remote Communication tab.



3. Select the Encoding Format. The format selected must match the format transmitted and received from the remote computer.
4. Select the Device. This can be the instrument computer's Serial Port or Network Port.
5. Select Configuration, and configure the port selected.
6. If the Serial Port was selected, select the proper communications Port of the local computer. Then set the Baud Rate, Data Bits, Parity, Stop Bits, and Flow Control to match the remote computer.
7. If the Network Port was selected, enter the port number to communicate with the remote computer. If you do not know the network port number, ask your local network administrator.
8. Once the system is configured and operating properly, select the remote communication mode.
Select Enable Remote Communications to enable the remote sample login mode.
Select Remote Control on Startup to enable remote control mode to start automatically when the software is started.
9. Configure the transmission format.
 - A. On the Automation tab, select in the Automatically Transmit Each New Analysis checkbox if the sample results are to be automatically transmitted in this format after each sample is run. Multiple transmission formats can be created. Formats with this checkbox checked will be automatically transmitted. If no formats have this checkbox checked, automatic transmit will not occur unless a remote control or remote sample login command specifies sending the results.
 - B. On the Communications Settings tab, select in the Use Remote Communications Port checkbox.

XML Command Table

The following table is a list of XML Commands that the local computer can recognize and use. Only these commands should be sent from the remote computer.

Remote Sample Login & Remote Control Commands & Return Messages	Description
<pre><AddSample> <Name>sample name</Name> <Mass>mass</Mass> <Method>method</Method> <Comments>comments</Comments> <Description>description</Description> </AddSample> <u>RESPONSE</u> <OK></OK></pre>	Adds a new, unanalyzed sample.
<pre><Cancel></Cancel> <u>RESPONSE</u> <OK></OK></pre>	For debugging purposes only. Allows the software developer to cancel a partially entered command when using a remote terminal device.
<pre><Counters></Counters> <u>RESPONSE</u> <Counter> <Name>counter name</Name> <Count>counter count</Count> </Counter> (repeat)</pre>	Returns each of the counters maintenance values.
<pre><Disconnect></Disconnect> <u>RESPONSE</u> <OK></OK></pre>	Disconnects from the remote computer and waits for a new connection.
<pre><Help></Help> <u>RESPONSE</u> All commands available</pre>	For debugging purposes only. Allows the software developer to query the list of supported XML commands.

Remote Sample Login & Remote Control Commands & Return Messages	Description
<pre><Login> <User>user name</User> <Password>password</Password> </Login></pre> <p><u>RESPONSE</u></p> <pre><OK></OK></pre>	Logs in a new user.
<pre><Logoff></Logoff></pre> <p><u>RESPONSE</u></p> <pre><OK></OK></pre>	Logs off the current user.
<pre><Results> </Results></pre> <p><u>RESPONSE</u></p> <pre><Results> sample results – user configurable </Results></pre>	Returns the results of the most recently analyzed sample.

Remote Sample Login & Remote Control Commands & Return Messages	Description
<pre><Status></Status> <u>RESPONSE</u> <Status> <User>user name</User> <Hardware>hardware status</ Hardware> <Analyzing> (only if analyzing) <Name>sample name</Name> <Method>method name</<Method> <Location>sample location</Location> </Analyzing> <LastAnalyzed> sample results – user configurable </LastAnalyzed> <SamplesRemaining># of samples</SamplesRemaining> <LastCalibrated> <Method>method name</Method> </LastCalibrated> </Status></pre>	Returns the status of the instrument, including the current user name, hardware status, the currently analyzing sample (if there is one), the last analyzed sample, number of samples remaining to be analyzed, and the last method to be calibrated.
<pre><Version></Version> <u>RESPONSE</u> <Version> <Commands>XML parser version</Commands> <Program>software version</Program> </Version></pre>	Sends the XML parser version and the software version.

Messages

Remote Control Return Messages	Description
<u>RESPONSE</u> <InstrumentError> <Action> <i>action that was being taken</i> </Action> <ObjectType> <i>type of object for error</i> </ObjectType> <ObjectName> <i>name</i> </ObjectName> <Details> <i>details of the error</i> </Details> <User> <i>name of the operator</i> </User> <DateTime> <i>date and time of error</i> </DateTime> </InstrumentError>	Instrument had an error and is passing on the details to the listener.
<u>RESPONSE</u> <SampleDetected> <Name> <i>name of the sample</i> </Name> </SampleDetected>	Sent when a system has a way to detect the arrival of a sample and one has arrived.

Command Examples

Add an unanalyzed sample

All options are not mandatory. Any missing options will be the previously entered value>

```
<AddSample>
    <Name>Sample-1</Name>
    <Mass>0.997</Mass>
    <Method>Method-1</Method>
</AddSample>
```

Create a Data Transmit Format

```
<SetTransmitFormat>
    <Name>New Format</Name>
    <Fields>
        <Field>Name</Field>
        <Field>Method</Field>
        <Field>Analysis Date</Field>
        <Field>Mass</Field>
        <Field>Carbon %</Field>
    </Fields>
</SetTransmitFormat>
```

Create a User Defined Field

```
<SetUserDefinedField>
    <Name>Notes</Name>
    <Login>True</Login>
</SetUserDefinedField>

<SetUserDefinedField>
    <Name>Mass in cg</Name>
    <ReadOnly>True</ReadOnly>
    <Numeric>True</Numeric>
    <Formula>[Mass] * 100</Formula>
    <Stats>True</Stats>
</SetUserDefinedField>
```

Delete results 100 days old or older

```
<DeleteResults>
    <Days>100</Days>
</DeleteResults>
```

Login

A password is only necessary if the user name requires a password.

```
<Login>
    <User>Star</User>
    <PASSWORD>Wars</PASSWORD>
</Login>
```

Logoff

```
<Logoff></Logoff>
```

Modify the contents of sample field

```
<ModifySample>
    <Operator>me</Operator>
    <Notes>I modified this field</Notes>
</ModifySample>
```

Request data transmit of a specified format for the specified sample

```
<TransmitSamples>
    <Format>New Format</Format>
</TransmitSamples>
```

Retrieve the analysis results

```
<Results>
</Results>
```

Start an analysis

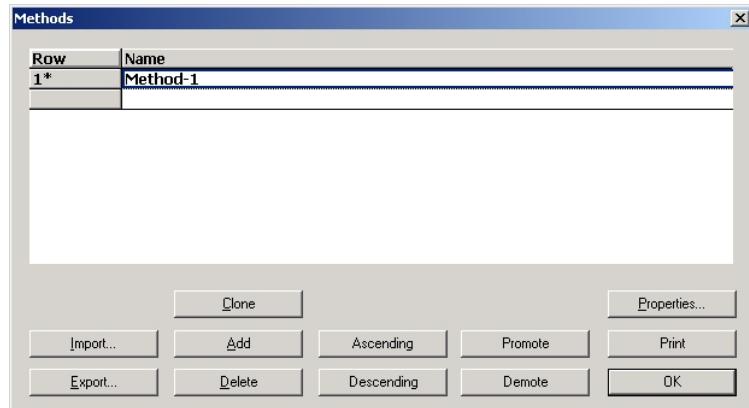
```
<Analyze>
</Analyze>
```

Creating and Modifying a Method

A method is a set of analytical parameters used to control the instrument during analysis and calculation of the final result. Before analysis, a method must be created or the default method used.

Creating a Method

1. From the Configuration menu, select Method. The Method dialog box will appear.

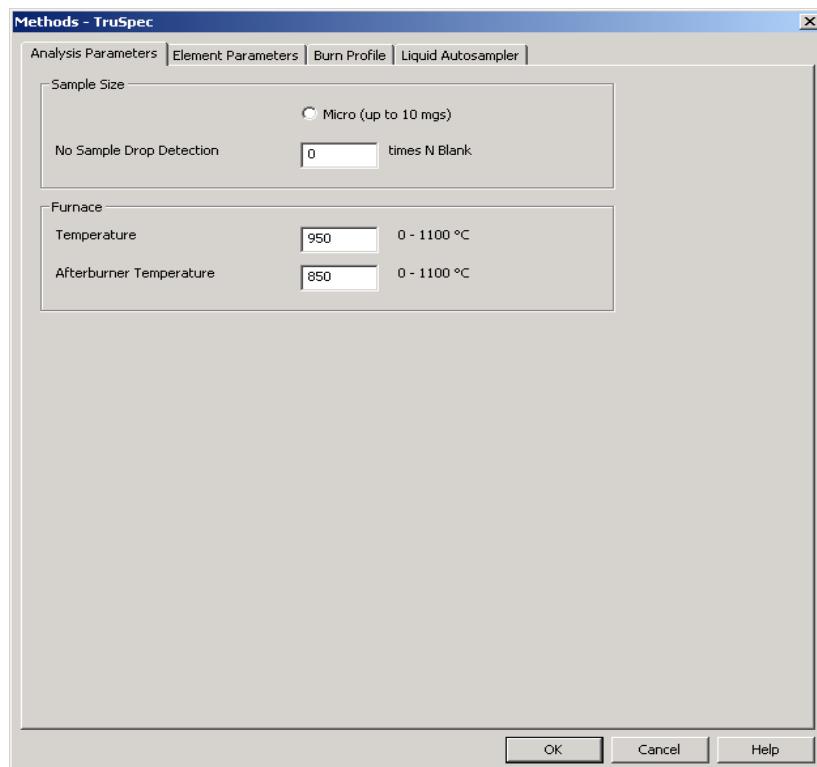


2. Select Add to create a method. A row will be added to the bottom of the spreadsheet.

NOTE

You can also select an empty row and enter a method name.

3. Select Properties. The Analysis Parameters dialog box will appear.

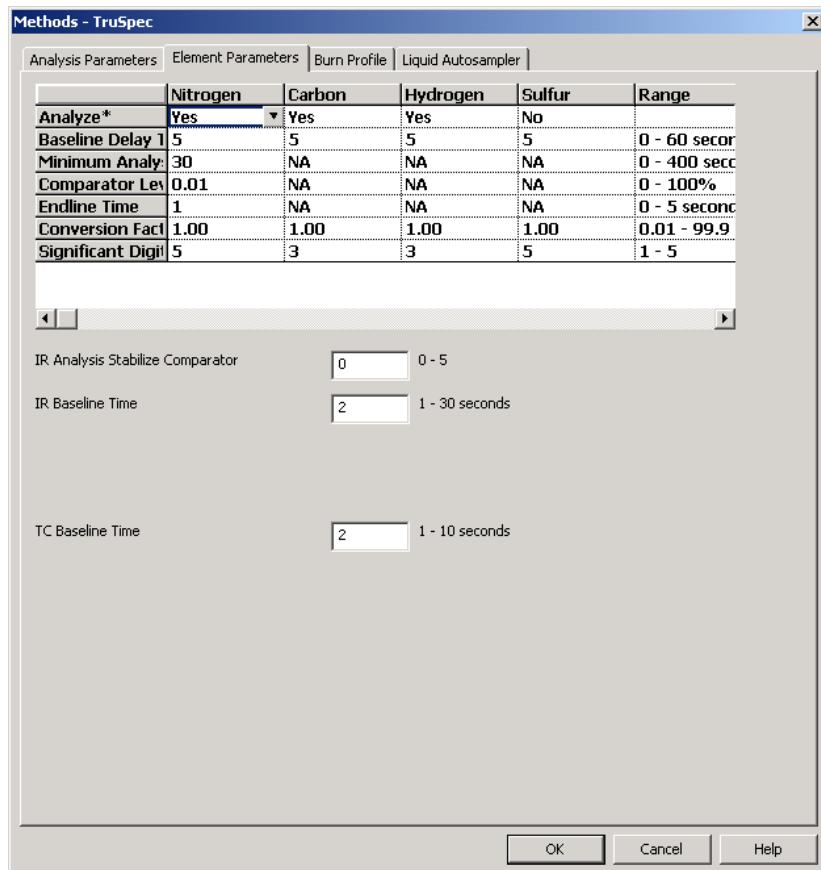


- A. Refer to [Analysis Parameter Definitions](#), page 4-53, and enter the desired analysis property values.
- B. Select OK when finished.

NOTE

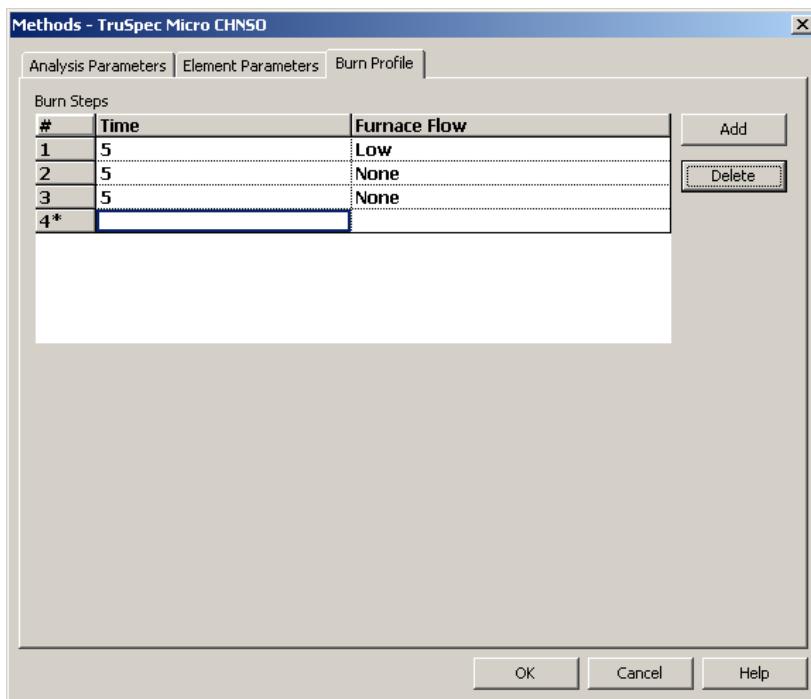
TruSpec® Micro—Although most official methods state 850°C as the acceptable temperature for combustion in the primary furnace, LECO recommends 1100°C to achieve the highest level of sample oxidation.

- C. Select the Element Parameters tab to display the element properties dialog box.



- D. Refer to [Element Parameter Definitions](#), page 4-53, and enter the desired element property values.
- E. Select OK when finished.

- F. Select the Burn Profile tab to display the burn profiles properties dialog box.



- G. Refer to Burn Profile Definitions, page [4-54](#), and enter the desired burn profile property values.

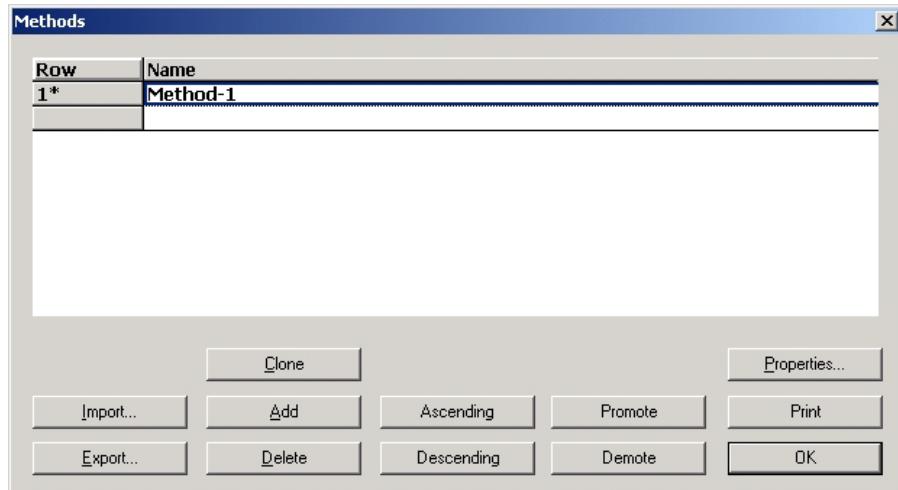
- H. Select OK when finished.

NOTE → Refer to Setting the [Burn Profile Definitions](#), page [4-54](#), for more information about Burn Profiles.

Modifying a Method

NOTE → Using this procedure you can also edit the method list.

1. From the Configuration menu, select Method. The Method screen will appear.
2. Select the Method to be edited.

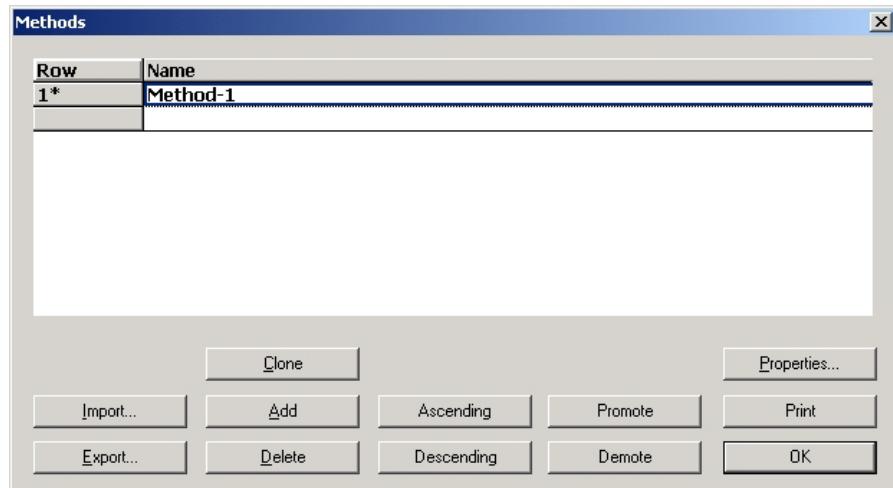


3. Select Properties to change the method properties. Refer to [Creating a Method](#), page [4-44](#).
4. To move a selected method up toward the top of the list, select it and select Promote.
5. To move the selected method down toward the bottom of the list, select it and select Demote.
6. Select Ascending to list the method in ascending (A to Z) alphabetical order.
7. Select Descending to list the method in descending (Z to A) alphabetical order.
8. Select OK to save any changes and exit.

Cloning a Method

NOTE → After a method is cloned, the name and desired parameters can be changed to create another method.

1. From the Configuration menu, select Method. The Method screen will appear.

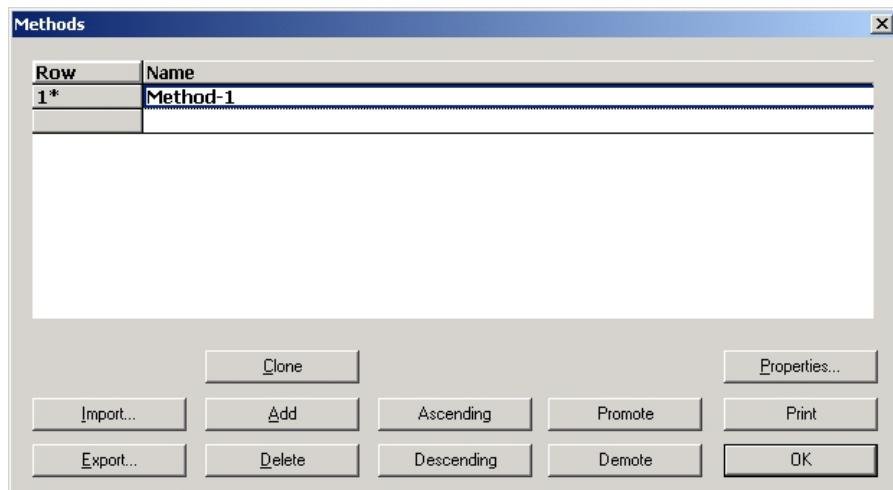


2. Select a method to clone by selecting the method row.
3. Select Clone to add another method to the method list with the same method parameters as the selected method.
4. Select the cloned method name and change it to make it different from the selected method.
5. Select OK to exit and save the cloned method.

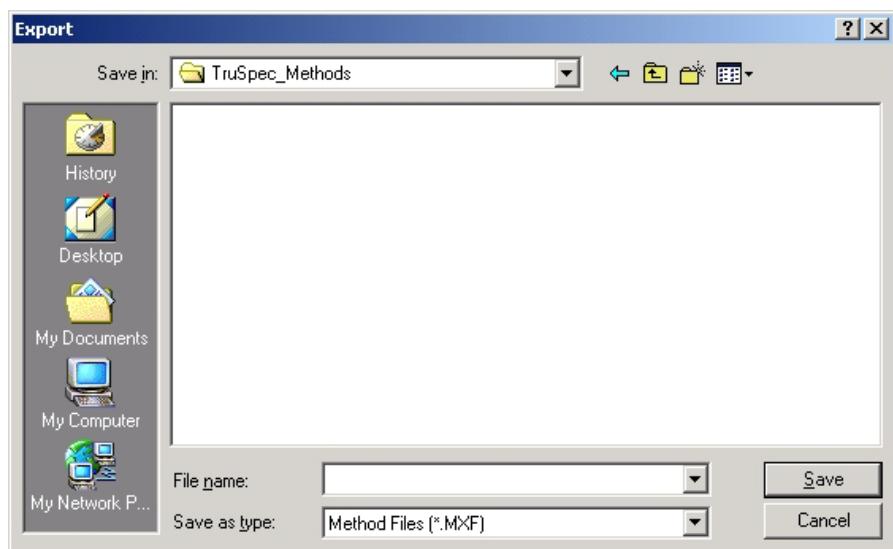
Exporting a Method

Export a Method permits the operator or manager to copy a method to a file. The method can be saved on the systems hard drive or transferred to another media for safe storage. If necessary, the method can be imported to the same instrument or transferred to another *TruSpec* instrument. Refer to [Importing a Method](#), page 4–50.

1. Select the Configuration menu and select Method. The Method screen will appear.



2. Select the method to export by selecting on it. An asterisk will appear next to the selected method.
3. Select Export. The export method selection screen will appear.



4. Select the folder to store the method in. The method name will appear as the file name. Do not enter an extension. The software will automatically add the proper file extension.

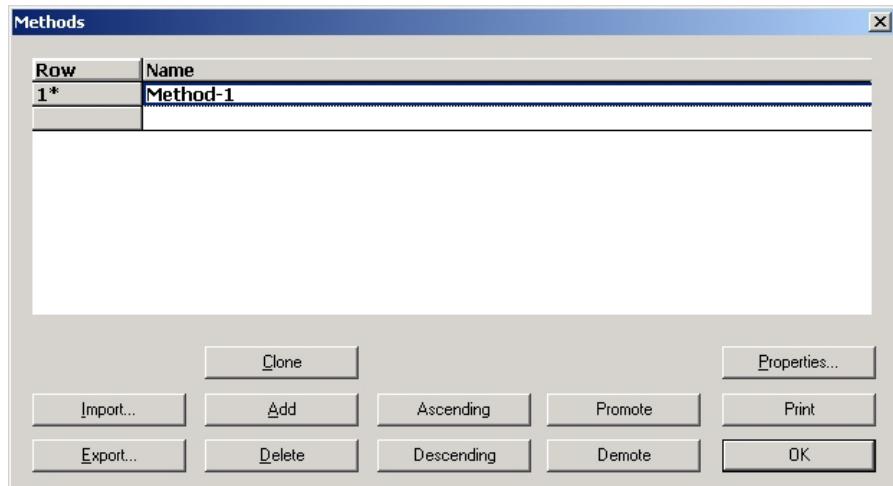


5. Select Save to copy the method to the selected file.

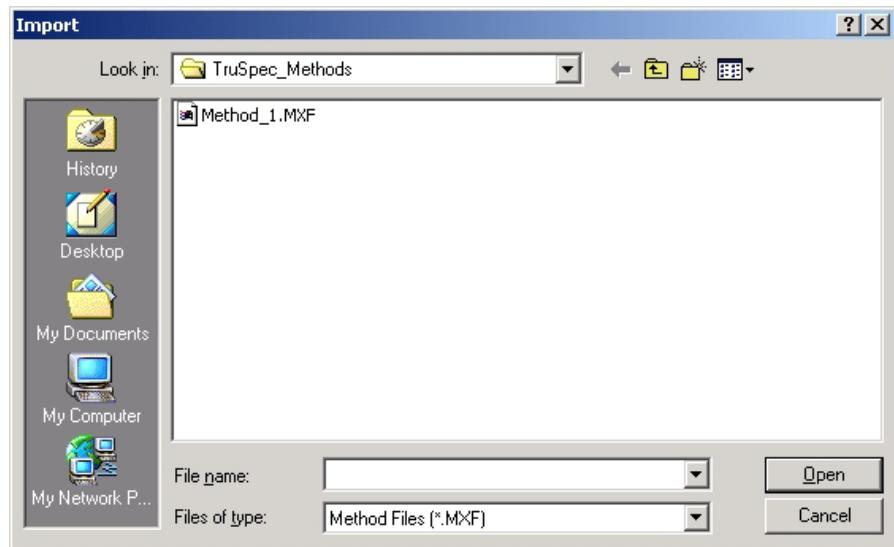
Importing a Method

Import a Method transfers an exported method to an instrument and adds it to the method list. A method can be imported that was developed on the present instrument or another *TruSpec* instrument.

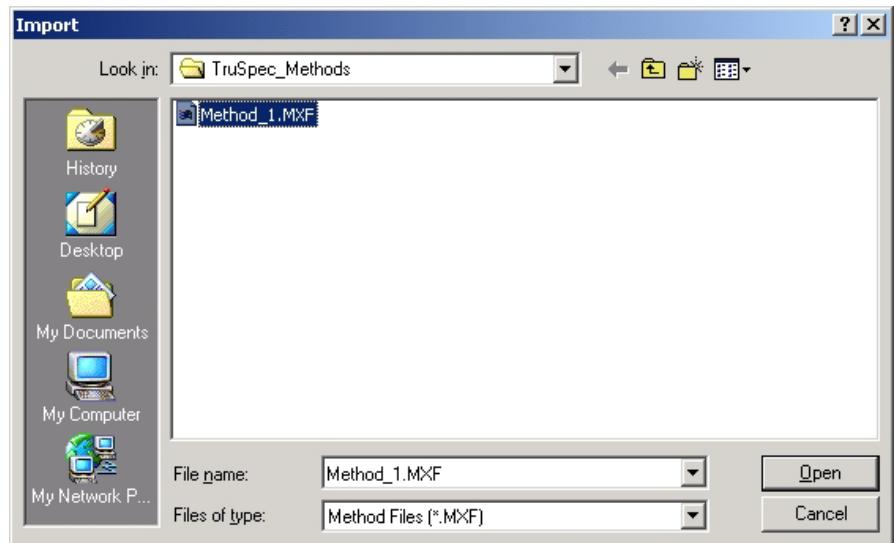
1. Select the Configuration menu and select Method. The Method screen will appear.



2. Select Import to import a saved method. The import method file selection screen will appear.



3. Select the Method File to import.



4. Select Open. The method will be added to the analysis method list.

Deleting a Method

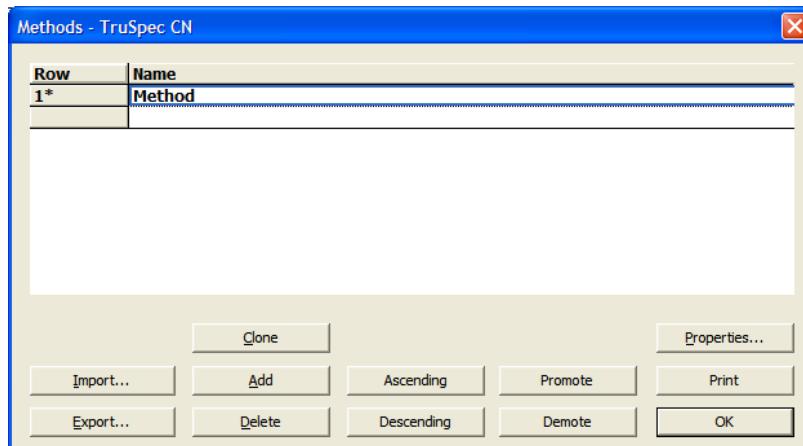


If a method is deleted using this procedure, all samples and calibrations associated with the method are also deleted.

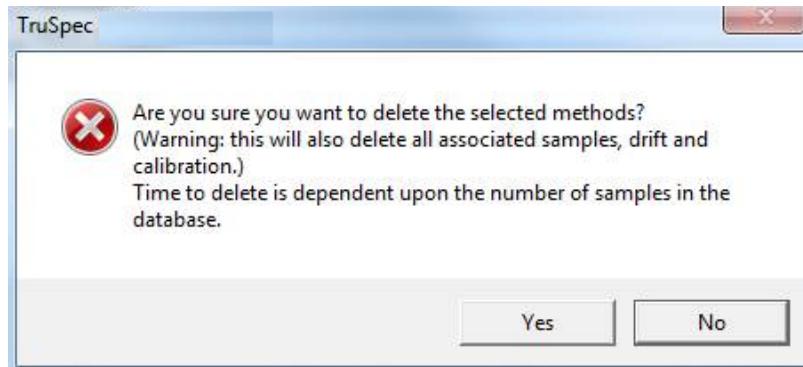


Once a method is deleted, it cannot be restored.

- From the Configuration menu, select Method. The Method screen will appear.



- Select a method to delete by selecting the method row.
- Select Delete to delete the selected method from the method list. A confirmation dialog box will appear.



- Select Yes to delete the selected method.

Analysis Parameter Definitions

Sample Size—Selects the microanalysis mode of operation.

No Sample Drop Detection—Determines if a sample has dropped into the furnace by comparing the nitrogen area of a blank analysis against the nitrogen area of the current analysis multiplied by a constant. The default constant value is 3. If the result area is less than the blank area multiplied by the constant value, analysis will stop and an error message will be logged.

Furnace Temperature—Sets the operating temperature of the furnace (primary furnace) as defined in the method. Typically, the combustion furnace is set at 950°C.

Afterburner Temperature—Sets the operating temperature of the Afterburner (secondary furnace) as defined in the method. Typically, the afterburner is set at 850°C.

Element Parameter Definitions

Analyze—Determines if a sample result will be calculated and displayed for selected element.

Baseline Delay Time—The amount of delay time prior to collecting baseline data after the Analysis Stabilize Comparator is finished.

Minimum Analysis Time—The minimum amount of time allotted for analysis. This is also called integration time. During this time the cell output is being integrated to determine the result. Default: Nitrogen - 30 seconds.

Comparator Level—The minimum concentration percentage, expressed as a percentage of peak height and offset, which will stop analysis. Analysis will stop when the detection system output is below a significant concentration level. The comparator level is effective only after the minimum analysis time is met. Default: Nitrogen – 0.01%.

Endline Time—The amount of time used to collect baseline value after the peak. Collection begins after the comparator level has been reached. Endline Time is used in conjunction with the baseline taken before the peak. Default: Nitrogen – 1 second.

Conversion Factor—The factor used to convert Percent to User Defined. Percent multiplied by the Conversion Factor equals User Defined. Conversion Factor is only used when Percent is selected under Reporting Units. Refer to [Showing an Element Plot in the Dashboard](#), page 4–25. Default: 1.

Significant Digits—The number of significant digits displayed in the analysis result. This includes the number of digits to the right and left of the decimal point. For example, three significant digits would produce answers displayed as 0.0325% and 0.0125%. Four significant digits would produce answers displayed as 0.03253% and 0.01253%. Default: Carbon - 3, Nitrogen – 5.

Standard Additions Offset—To apply the method for standard additions, check the Apply Standards Offset checkbox and select Linear for the calibration curve. Blank subtraction cannot be used. Refer to [Method of Standard Additions](#), page 7–6.

IR Analysis Stabilize Comparator—Monitors the IR cell baseline for stability after the purge cycle is complete.

- Set to 0—IR cells will not be monitored for stabilization.
- Set to > 0—IR Cells will be monitored for stabilization after purge is complete to ensure baseline stability. The baseline rate of drift (slope) must stabilize below the entered (slope) value for at least 5 seconds before continuing with analysis.

IR Baseline Time—The selected amount of time to collect baseline data.

TC Baseline Time—Determines the amount of time to collect baseline data for the TC cell.

Burn Profile Definitions

Burn Steps—Selects the number of combustion steps for analysis. One to five steps may be added. Select Add to add steps. Select Delete to remove steps.

Time—The amount of time in seconds that the step will burn before the instrument switches to the next step. Select to enter the desired time.

Furnace Flow—The furnace gas flow rate. Selections are None and Low. Select to enter the desired flow rate.

Setting the Burn Profile

The burn profile permits the operator to turn the oxygen flow on and off during analysis. This permits the operator to set the proper combustion, maximize oxygen efficiency and reduce the use of reagents.

To select the flow rate and time period for each flow, refer to [Creating a Method](#), page 4-44.

[Figure 4-2](#), page 4-54, shows a typical burn profile. Flow 1 is set to low for 5 seconds. Flow 2 is set at none for 5 seconds. Flow 3 is set at low for 5 seconds.

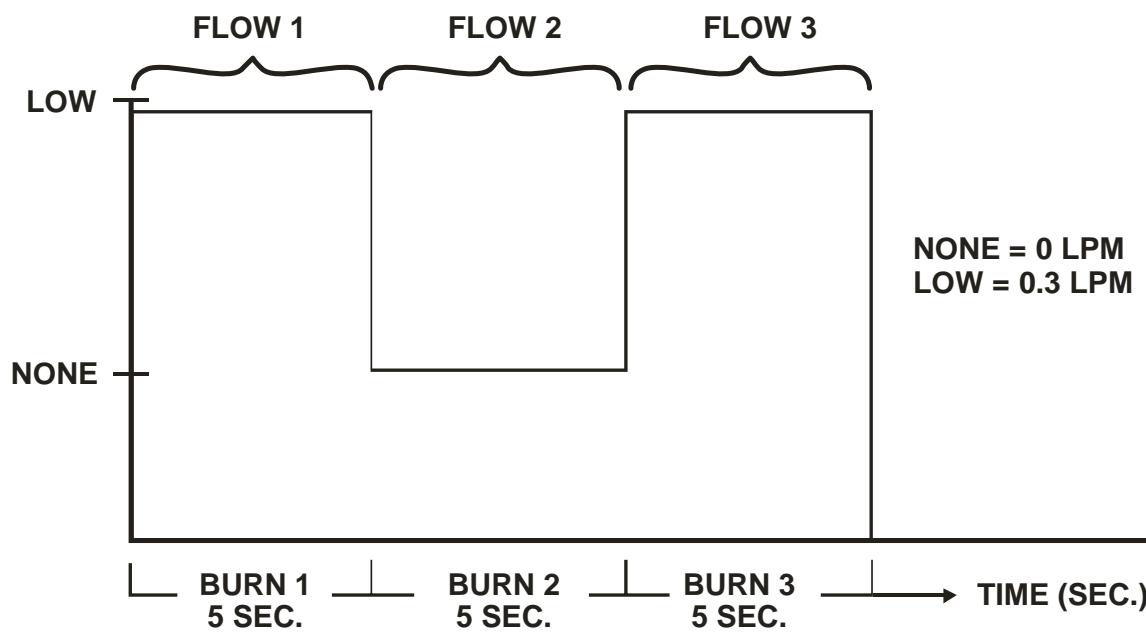


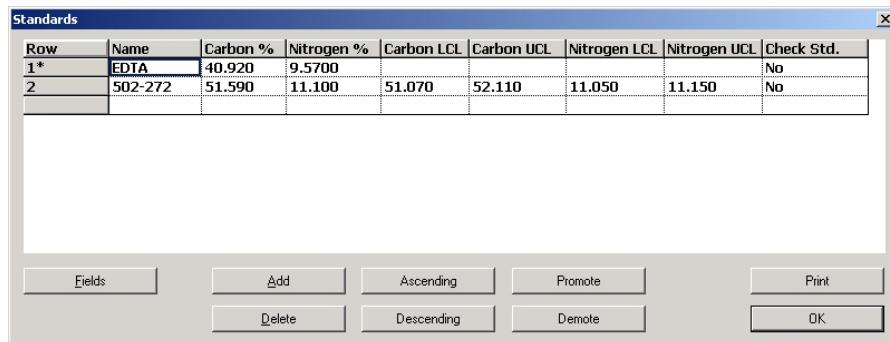
Figure 4-2
Burn Profile

Defining Calibration Standards

Define Calibration Standards creates a list of calibration standards and their values for use during calibration and drift correction.

NOTE → LECO recommends that certified reference materials be used for calibration development on the *TruSpec*.

1. From the Configuration menu, select Standards. The Standards dialog box will appear.



2. Select Fields to edit the displayed fields or columns on the Standards screen.
3. Select Add to list a standard. A row will be added to the bottom of the spreadsheet.
4. Select the row and enter a standard name, value, lower control limit (LCL) and upper control limit (UCL).

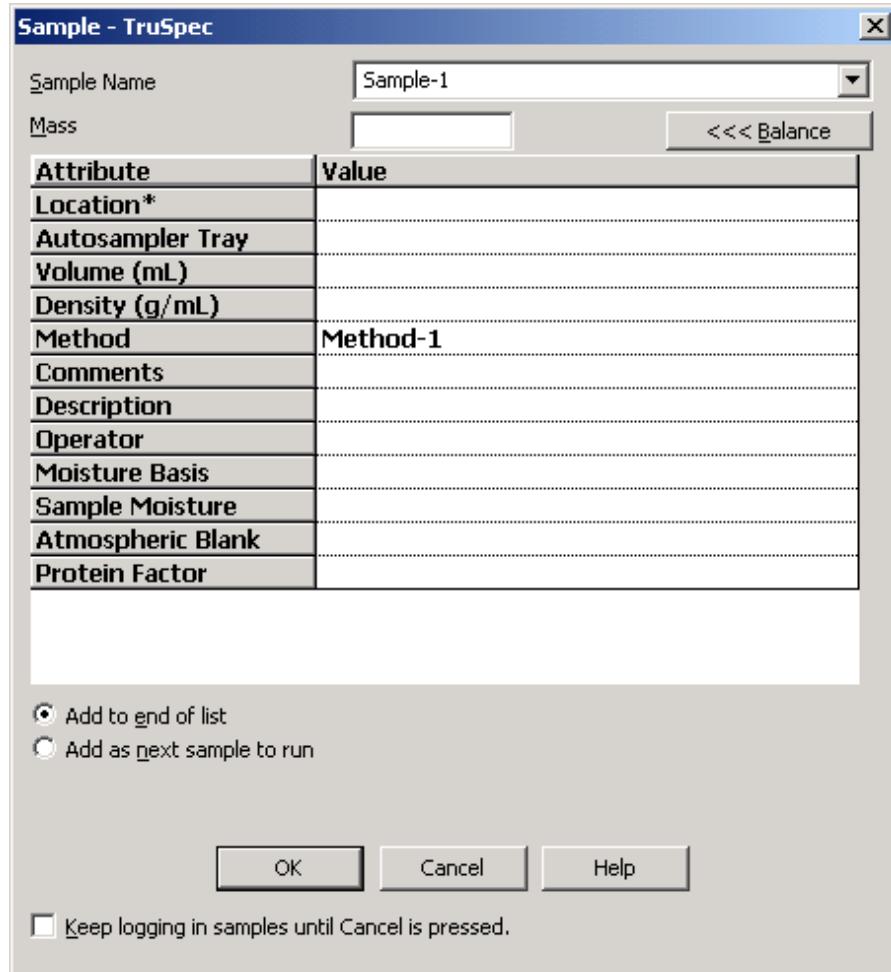
NOTES →

- The lower control limit, or LCL, is the minimum standard result value that will allow analysis to continue. If the standard result is below the lower control limit, a notice will appear and analysis will stop, permitting the operator to make corrections and then restart the analysis.
 - The upper control limit, or UCL, is the maximum standard result value that will allow analysis to continue. If the standard result is above the upper control limit, a notice will appear and analysis will stop, permitting the operator to make corrections and then restart analysis.
 - If an LCL or UCL value is not entered, analysis will continue regardless of the result data.
5. To move a selected standard up toward the top of the list, select it and then select Promote.
 6. To move the selected standard down toward the bottom of the list, select it and then select Demote.
 7. Select Ascending to list the standard in ascending (A to Z) alphabetical order.
 8. Select Descending to list the standard in descending (Z to A) alphabetical order.
 9. Select OK to save any changes and exit.

Logging in using Calibration Reference Material

NOTE → Before a sample can be analyzed as a standard, it must be added to the Standards List. Refer to [Defining Calibration Standards](#), page 4–55.

- From the Samples menu, select Login. The Sample Login dialog box will appear.



- Select the drop-down arrow in the sample name selection box and select a defined standard from the list.
- Enter the information required in the Login Screen. Refer to Standard Login, page 4–57, for additional information.
- Select OK to log in the standard.

Standard Login Definitions

Sample Name—The name or type of sample. A standard should be entered for the sample name. Select the down arrow to select from the list of standards.

Mass—The mass of the standard. Select Balance to enter a mass from an external balance.

Method—The method used for analysis. Select the down arrow to select from the list of methods.

Comments—A statement used to explain an operation or procedure. This is an optional entry.

Description—A statement used to explain or identify a sample. This is an optional entry.

Operator—The name of the operator. This is an optional entry.

Moisture Basis—No entry should be made for standard login.

Sample Moisture—No entry should be made for standard login.

Add to End of List—Select to enter the logged in standard in the last row of the spreadsheet.

Add as Next Sample to Run—Select to enter the logged in standard after the last sample that was analyzed.

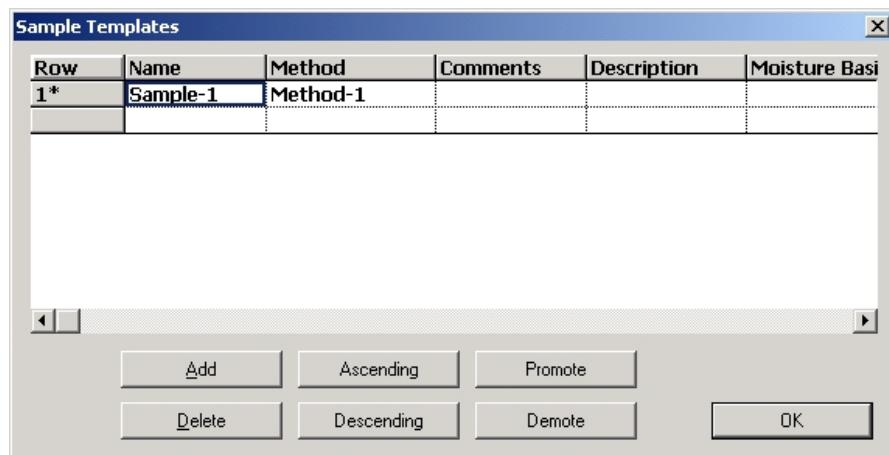
Keep Login Samples until Cancel is Pressed—Select this box to log consecutive standards. The dialog box will reappear after OK is selected. This is an optional entry.

Sample Templates

Sample Templates is a quick way for the operator to log in a sample and enter a method, comment, and description.

Creating a Sample Template

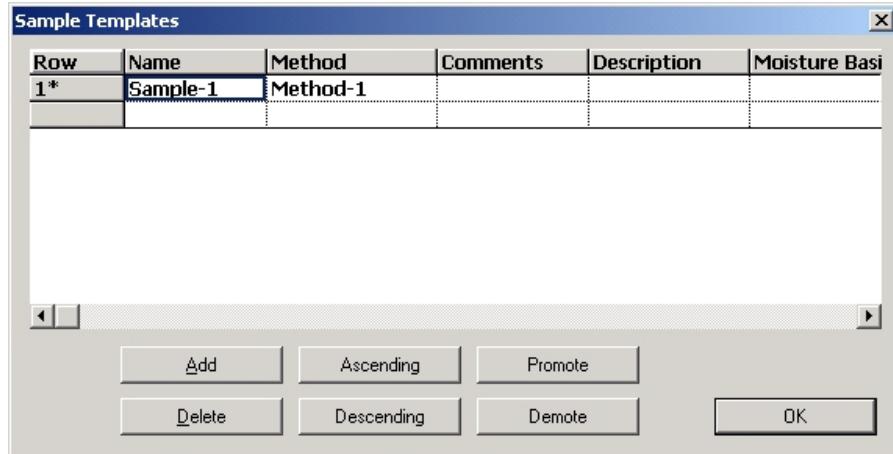
1. An analysis method should be developed before a sample is logged in. Refer to [Creating a Method](#), page 4-44.
2. From the Configuration menu, select Sample Templates. The Sample Templates screen will be displayed.



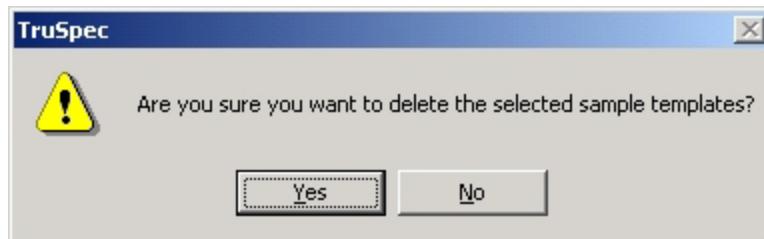
3. Select Add to create a method. A row will be added at the bottom of the list. Enter a method name.
4. To change the name, select the default name by selecting the name and entering a new name.
5. Select the method cell and enter a method.
6. Select the comments cell and enter any comments.
7. Select the description cell and enter a description.
8. Select OK to save any changes and exit.

Deleting a Sample Template

1. From the Configuration menu, select Sample Templates. The Sample Templates screen will appear.
2. Select the Sample Template to delete.



3. Select Delete. The Sample Template Delete screen will appear.



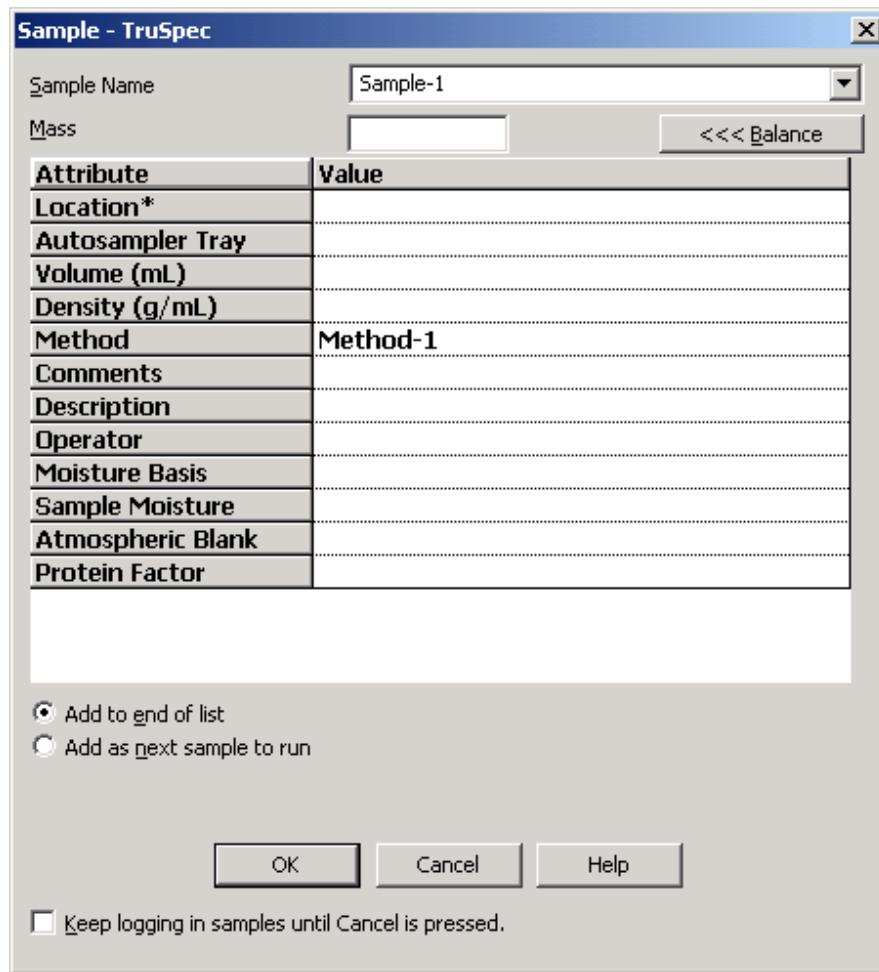
4. Select Yes to delete the sample template or No to exit without deleting the sample template.

Editing the Sample Template List

1. Select a sample template and select Promote to move a selected method up toward the top of the list.
2. Select a sample template and select Demote to move the selected method down toward the bottom of the list
3. Select Ascending to list the transmission formats in ascending (A to Z) alphabetical order.
4. Select Descending to list the transmission formats in descending (Z to A) alphabetical order.
5. Select a sample template and select Delete to remove it from the sample template list.

Logging in using a Sample Template

1. From the Samples menu, select Login. The Sample Login dialog box will appear.



2. Select the drop-down arrow to the right of sample name and enter the desired sample name from the drop-down list. The sample name, method comments, and description will automatically be entered into the spreadsheet.
3. Continue with sample login and enter the other necessary information.

NOTE →

Refer to [Sample Login](#), page 5–14, for additional information.

Sample Filters

Sample filters permits the operator to sort and display sample data based on a predefined requirement. Fields can be selected to display a certain name or value. Fields can also be mathematically compared and displayed according to a requirement.

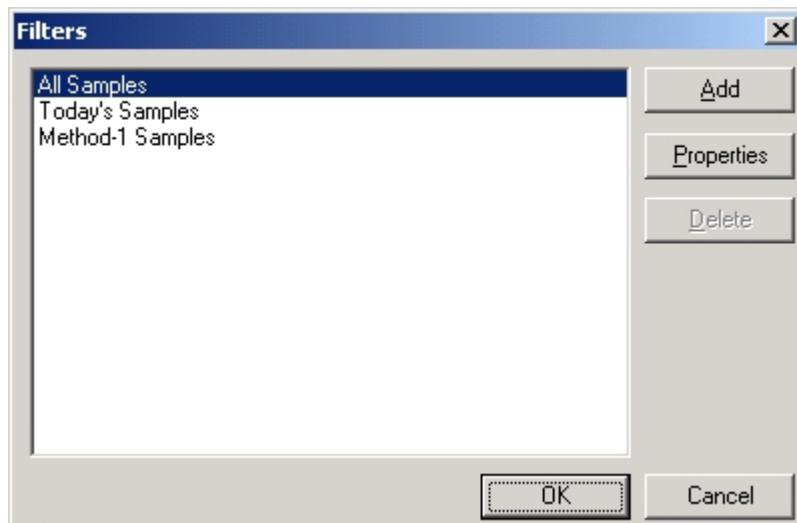
NOTE → There are three predefined fields:

- All Samples—displays all the sample data in the database.
- Today's Samples—displays all samples run today.
- Method-1 Samples—displays all the samples run using Method-1.

Applying a Filter and Sorting Sample Data

1. From the Configuration menu, select Sample Filters. The Sample Filters dialog box will appear.

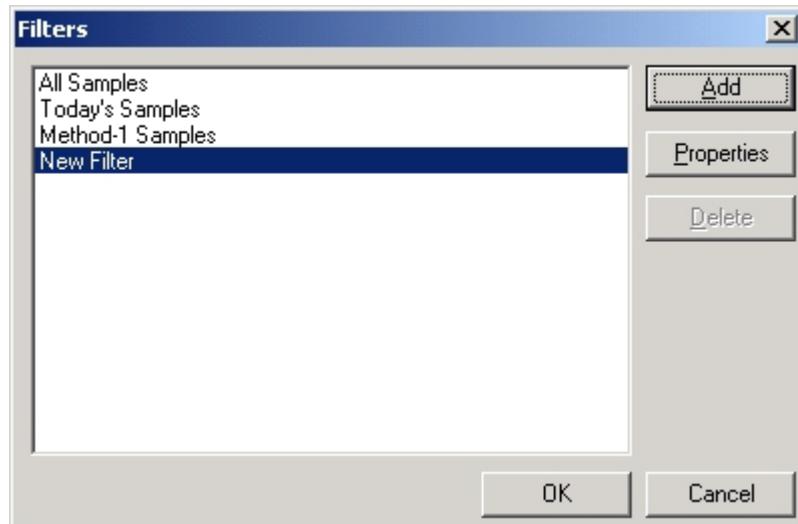
NOTE → The filters All Samples and Today's Samples will always appear. In addition, a filter will appear for each defined method.



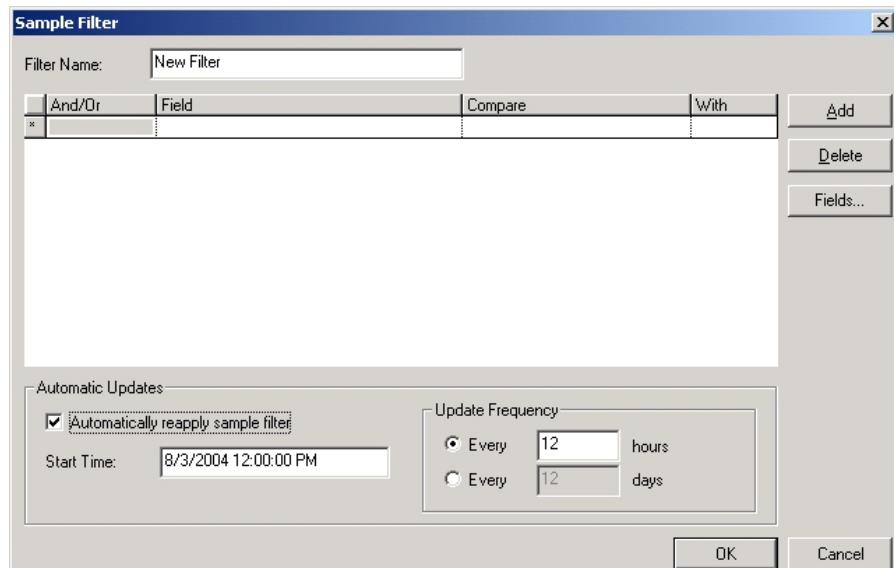
2. Select the desired sample filter and select OK. The dialog box will disappear and the sample grid will reappear with the filter applied.
3. Select Cancel to exit without applying the filter.

Defining a Filter to Apply

1. From the Configuration menu, select Sample Filters. The Sample Filters Selection dialog box will appear.



2. Select Add to define and add a sample filter to the list. A new filter with the filter name New Filter will be added to the list.
3. To define the new filter select New Filter and then select Properties. The Properties Dialog Box will appear.



4. From the Properties Dialog Box you can define the filter.
5. Select the Filter Name to enter and change the filter name. This is the name that will appear in the Sample Filter Selection dialog box.

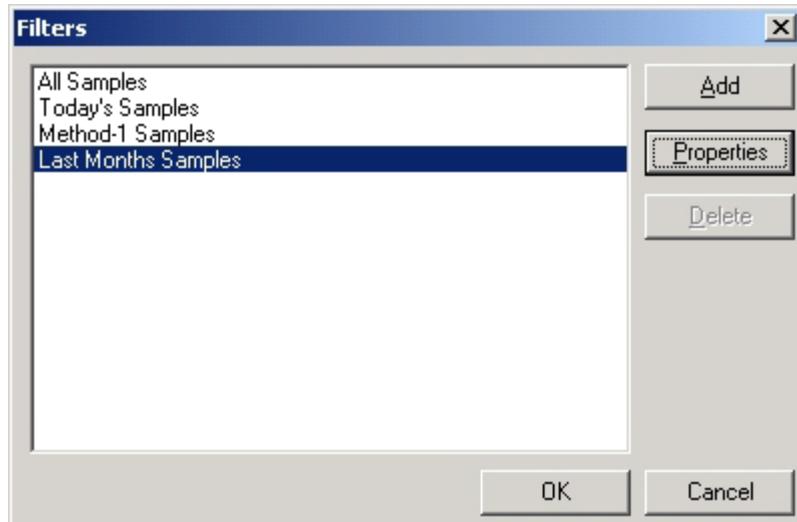
6. Select the cell under Field and enter a sample field to sort. As examples, you can sort on a sample name or method. A drop-down arrow will appear. Select the desired field from the list.
7. Select the cell under With to sort the field name with. As an example, the field name can be sorted with a specific sample name. Equal will automatically appear in the Compare field.
8. If you enter a numeric value in the With field, select the compare cell and enter the desired operator. Operators are: equal, greater than, greater than or equal, less than, or less than or equal. The field name will be sorted with the value using the compare operator.
9. Select a filter and select Fields to select the fields to display when the filter is used.
10. Select a filter and select Delete to delete the filter.

Automatically Reapplying the Sample Filter

Automatically Reapply Sample Filter is used to reapply a defined sample filter at a predetermined time and frequency.

For example: If you create a filter that displays samples from the previous 30 days, it will show samples from the last 30 days when it is first applied. If it is not reapplied, samples that originally matched the filter plus all the new samples will be added to the spreadsheet. To prevent this from happening, automatically reapply the filter daily, preferably at a time when the instrument is not being used..

1. From the Configuration menu, select Sample Filters. The Sample Filters dialog box will appear.

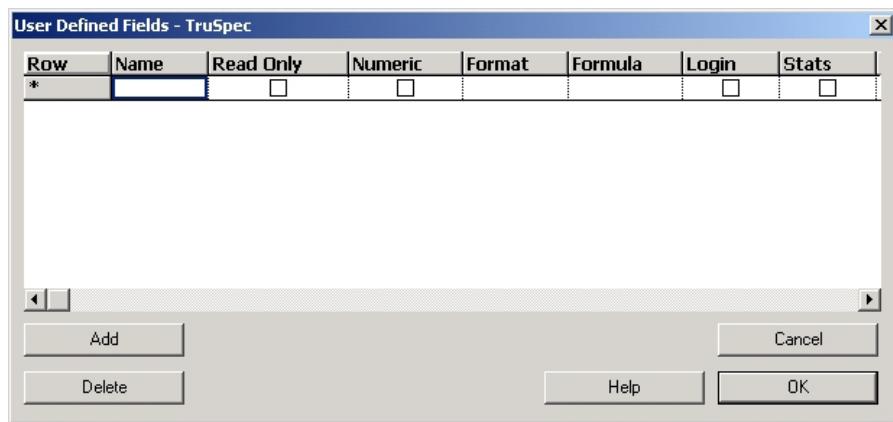


2. Select the filter to automatically apply and then select Properties. The Properties Dialog Box will appear.
3. Check Automatically Reapply Sample Filters.
4. Enter the time, date, and update frequency.

User Defined Fields

The User Defined Fields allows customized fields to be added to the spreadsheet. User defined fields can display results from functions or they can display customized text such as notes or comments.

1. From the Configuration menu, select User Defined Fields.



2. Create or modify a user field as follows:

To create a user field, select Add. A new row will be inserted into the table.

To modify a user field, select the desired user field in the table.

To delete a user field from the table, select the row of the desired user field and select delete.

3. Complete the table for the new or revised user field as follows:

Select the Read Only checkbox to prevent the user field from being edited in the spreadsheet.

Select the Numeric checkbox to restrict text and only display numeric values.

For Format, enter a format to determine how the result of the user defined field displays in the spreadsheet. Refer to [Number Formatting](#), page 4-65.

For Formula, enter a formula to use if the field will be used for a calculation. Refer to [Formulas](#), page 4-66.

Select the Login checkbox and the field will appear in the Login Sample dialog box. Refer to [Sample Login](#), page 5-14.

Select the Stats checkbox and statistics will be available in the Dashboard Properties dialog box as a value you can add when you select Show Value and then Add. Once selected as a Show Value, it is displayed on the dashboard. Refer to [Configuring the Dashboard](#), page 4-28. When selected, both Read Only and Numeric are automatically selected.

Select the **Standard** checkbox and the user defined field can be used as a standard, which means the standard can define its value and range, and can be calibrated.

Number Formatting

Use the Format column in the User Defined Field dialog box to enter a number format. This format determines how the result of the user defined field appears in the spreadsheet. The following section provides examples of formats and how the result will display depending on which format is utilized.

Format Examples

*Format Type	Number	Format for Result	Result
A	4.50360	A	4.50360000
Fn.m	0.123456	F4.5	0.1235
	0.000789	F3.5	0.00079
	0.000789	F3.2	0.00
	321.8765	F3.5	322
	0.123456	S4.5	1.235E-1
Sn.m	0.000789	S3.5	7.9E-4
	0.000789	S3.2	0.0E-1
	321.8765	S3.5	3.22E+2
	0.123456	E4.5	123.5E-3
En.m	0.000789	E3.5	790E-6
	0.000789	E3.2	000E-3
	321.8765	E3.5	322E+0
In	321.8765	I2	322

* A = Default format

n = Total number of significant digits to be represented

m = Maximum number of digits after the decimal to define readability

I = Integer

S = Scientific notation: An exponential format ($y.yyy \times 10^e$) in which any number is expressed as a number between 1 and 10 multiplied by a power of 10 that indicates the correct position of the decimal in the original number.

E = Engineering format: An exponential format that displays the exponent in multiples of 3.

F = Fixed point format: A format in which the decimal point is located at a single unchanging position in a predetermined number of digits.

Formulas

Formulas can be entered into the Formula column of the User Fields dialog box and are used to calculate the result. The following section provides some example formulas and the result based on their calculation.

Formula Examples

* Function Type	Example Function	Result
[Column Heading of Desired Analyte Value]	[Carbon %]	Analyte concentration value
@ABS(exp)	@ABS([Carbon %]-[Carbon Blank])	Absolute value
@Log10(exp)	@Log10([Carbon ppm])	Log base 10
@Ln(exp)	@Ln([Carbon %])	Natural log
@SQRT(exp)	@SQRT([Carbon %])	Square root
@Maximum(exp1,exp2)	@Maximum([Carbon %],[Carbon Blank])	Finds Maximum
@Minimum(exp1,exp2)	@Minimum([Carbon %],[Carbon Blank])	Finds Minimum
@IF(cond, true, false)	@IF([Carbon ppm]>5,[Carbon ppm],0)	If the Carbon ppm value is > 5, the Carbon ppm value will display, otherwise 0 will display
@AND(cond1, cond2)	@IF(@And([Carbon %]>0.01,[Nitrogen %]>0.01), 1, 0)	If both Carbon and Nitrogen % are > 0.01, 1 will display, otherwise 0 will display
@OR(cond1, cond2)	@IF(@Or([Carbon %]>0.01,[Nitrogen %]>0.01), 1, 0)	If either Carbon or Nitrogen % are > 0.01, 1 will display, otherwise 0 will display
@XOR(cond1, cond2)	@IF(@XOr([Carbon %]>0.01,[Nitrogen %]>0.01), 1, 0)	If JUST Carbon % or JUST Nitrogen % is > 0.01 (not both), 1 will display, otherwise 0 will display

- * exp = expression. Used to specify a field value or perform a calculation on field values. May be a single number or a function that returns a number.
- cond = condition. Used for comparisons based on a single condition or multiple conditions.

Managing Databases

NOTE → Over time, the instrument database can accumulate a great deal of information. It is good practice to establish a regular database backup procedure. Refer to [Creating and Retrieving Database Backups](#), page 4–69.

LECO software applications use a database to store and maintain all the information necessary to run the instrument, including methods, standards, system parameters, and sample results. A file system database is created automatically the first time the software is started. In addition, a database connection that contains the name and location of the database is created. The database connection is used to specify which database to open.

LECO software provides the means to create and maintain the instrument database and database connections. A database management wizard allows you to add database connections, to select a database connection for use, and to delete database connections. When you add a connection, it can be to a new database or to an existing database. The new connection name is added to the list of available database connections.

For 21 CFR Part 11 compliance, logging can be enabled when a database connection is created. When logging is enabled, Presentation Time, View History, and Archive Log appear on the Database menu in the instrument software.

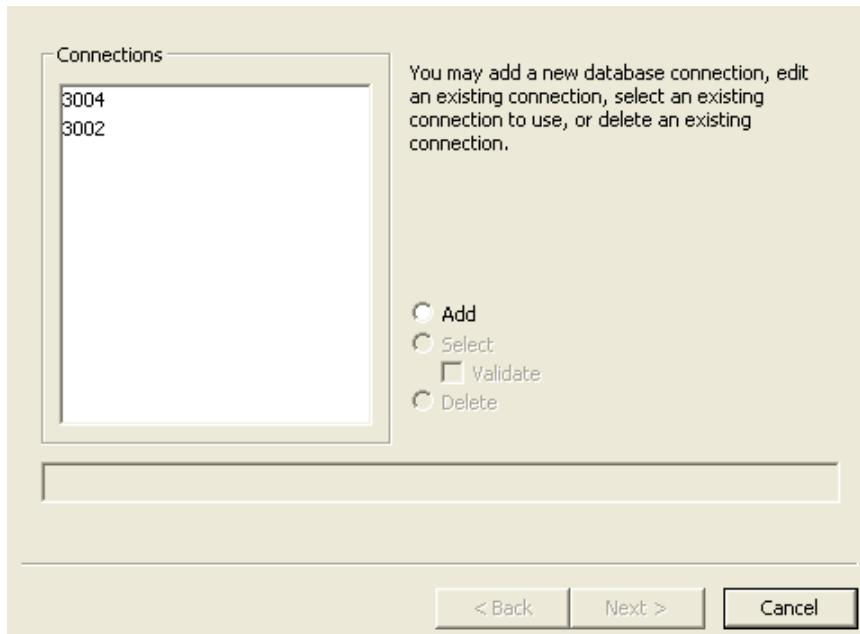
This section explains the following topics:

- [Using the Start Dialog Box](#), page 4–68
- [Creating and Retrieving Database Backups](#), page 4–69
- [Selecting a Database Connection](#), page 4–70
- [Adding a Database Connection](#), page 4–71
- [Deleting a Database Connection](#), page 4–74
- [Validating a Database](#), page 4–74
- [Compacting/Repairing a Legacy Database](#), page 4–76
- [Managing Databases for 21 CFR Part 11 Compliance](#), page 4–77
 - [Enabling Logging for an Existing Database](#), page 4–77
 - [Enabling Logging for a New Database](#), page 4–79
 - [Presentation Time](#), page 4–80
 - [View History](#), page 4–81
 - [Archive Log](#), page 4–82
 - [Adding a Connection to a Log Archive Database](#), page 4–83
 - [Removing Results from a Database](#), page 4–83
 - [Disabling Logging on an Existing Database](#), page 4–84

Using the Start Dialog Box

The following section explains how to use the Start dialog box in order to add a new database connection, select and, optionally, validate an existing connection, or delete a database connection. A compact/repair selection is available for legacy databases.

1. Exit the instrument software.
2. Select Start on the *Windows* desktop, select Programs, select LECO, select the instrument, and then select Database Management. The Start dialog box will appear.



When database connections are created, they will appear under Connections. The file path for the selected database connection appears at the bottom of the Start dialog box. Database connections that are no longer valid appear with dimmed text in the Connections list. When the user selects a dimmed connection, the software allows the user to delete the database connection or to reconnect to the database.

Select Add to add a database connection. Refer to Adding a Database Connection, page [4-71](#).

Or

Select an existing database connection and then make one of the following selections:

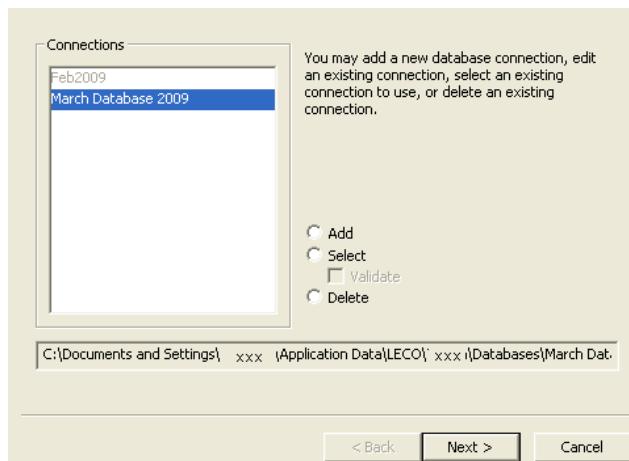
- Choose Select to connect to a database that already exists. Refer to [Selecting a Database Connection](#), page [4-70](#).
- Select Validate to validate the database with which the connection corresponds; however, Select must also be selected to perform validation. Refer to [Validating a Database](#), page [4-74](#).
- Select Delete to remove a database connection. Refer to [Deleting a Database Connection](#), page [4-74](#).
- Compact/Repair is not necessary for file system databases (and does not appear on the Start dialog box); however, it is available for Legacy Databases. Select Compact/Repair to compact an existing Legacy Database to conserve disk space and to repair a possibly corrupted Legacy Database. Refer to [Compacting/Repairing a Legacy Database](#), page [4-76](#).

Creating and Retrieving Database Backups

It is good practice to routinely back up data to prevent data loss in the event that something such as a hard drive failure should occur. The following procedure explains how to back up a database and should be performed on a regular basis. This procedure applies for all databases whether or not logging is enabled.

Create Backup

1. In the Start dialog box, highlight the database connection of the database to back up. The file location of the corresponding database will appear as shown in the following screen shot.



2. Close the instrument software.
3. To locate the files for the database connection, right-click on Start on the desktop and use *Windows Explorer* to navigate to the folder location.
4. Select the folder and select Copy.
5. Paste the files to the desired storage media (for example, CD, USB external drive, etc.) or network drive location.

Retrieve Backup

Data can be retrieved using either method, described as follows. The instrument software must be closed to perform either procedure.

If there is a problem with the original database and the backup is to replace it, copy the backup database folder from where it was stored and use *Windows Explorer* to paste the folder into the original folder location for the database. Be aware that data generated in the original database between the time the backup was made and the time the backed-up data is restored will be lost.

Or

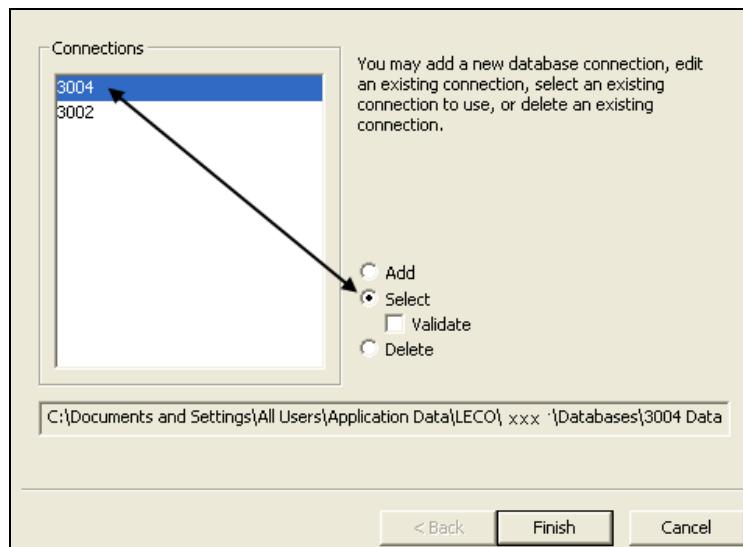
To access the backup as a separate database, copy the backup database to the desired location. If prompted, do not overwrite an existing database in this case. Use the Database Management wizard to add a database connection to this database. Refer to [Adding a Connection to an Existing Database](#), page 4-71.

NOTE →

If restoring from read-only media, after copying the database to its new location, use *Windows Explorer* to change the attributes for all folders and files so that they are not read only. To do this, right-click on the folder name, select Properties, and then clear the Read Only checkbox.

Selecting a Database Connection

1. Exit the instrument software.
2. Select Start on the *Windows* desktop, select Programs, select LECO, select the instrument, and then select Database Management. The Start dialog box will appear.



3. Under Connections, select the desired database connection.
4. Choose Select.
5. Select Finish to open the selected database.

Adding a Database Connection

The following section explains how to connect to an existing database or a new database.

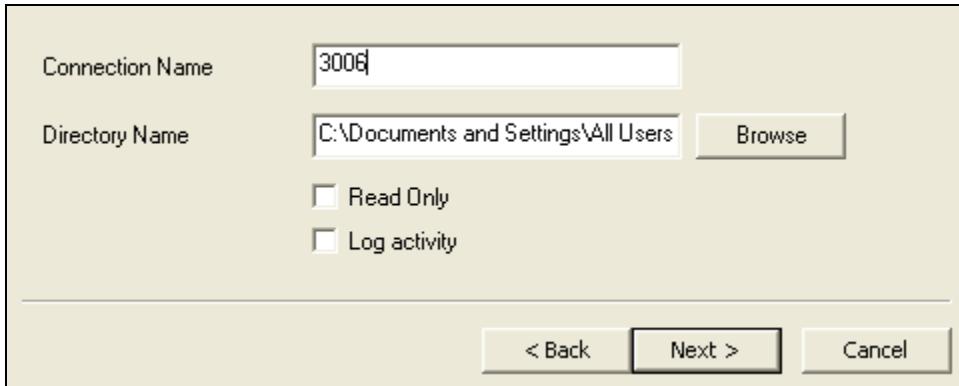
Refer to [Adding a Connection to an Existing Database, page 4–71](#).

Refer to [Adding a Connection to a New Database, page 4–72](#).

Adding a Connection to an Existing Database

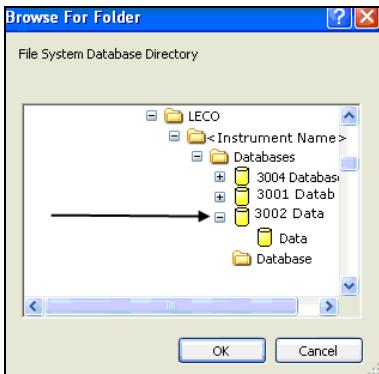
Connecting to an existing database allows you to use an existing file system database, which could be very important in a situation that required a software reinstall, such as a system crash. This type of connection provides the means to reconnect to an existing database.

1. Exit the instrument software.
2. Select Start on the *Windows* desktop, select Programs, select LECO, select the instrument, and then select Database Management.
3. In the Start Dialog Box:
 - A. Select Add.
 - B. Select Next.
 - C. Select File System Database - Use Existing.
 - D. Select Next.
4. When the Connect File System Database dialog box appears, enter the information for the desired database as follows:



- A. For Connection Name, enter a name for the database connection that will also appear in the Start dialog box in the Connections list.
- B. For Directory Name:
 - 1) Select Browse.
 - 2) Navigate to the folder for the database and select it as shown in the following screen shot. Do not select the Data folder itself. The names assigned to the databases in the directory on your system may not match the folder names in the screen shot.

- 3) Select OK.



5. If desired, select the Read Only checkbox. When selected, the database information can be viewed but not changed. When the checkbox is cleared, the database can be modified.
6. Clear the Log Activity checkbox.
7. Select Next.
8. Select Finish.

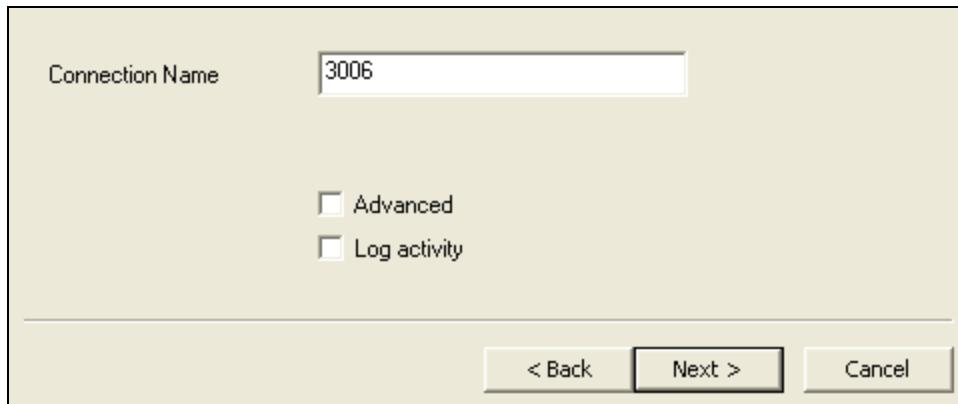
Adding a Connection to a New Database

New databases will be file system databases. This database type uses files and folders as its storage media. The size of the database is only limited to the free space on the hard drive.

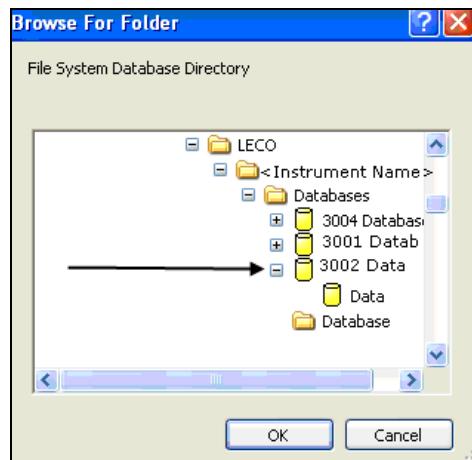
NOTE → To prevent the database from running slow, it is recommended that virus checking of the database directory be disabled. It is also recommended to use NTFS as the hard drive file format.

1. Exit the instrument software.
2. Select Start on the *Windows* desktop, select Programs, select LECO, select the instrument, and then select Database Management.
3. In the Start Dialog Box:
 - A. Select Add.
 - B. Select Next.
 - C. Select File System Database - Create New.
 - D. Select Next.

4. Complete the Create File System Database dialog box as follows:



- A. For Connection Name, enter a name for database connection that will also appear in the Start dialog box in the Connections list.
- B. To use the default location and name for the database folder, proceed to step C. To use another location:
 - 1) Create a folder in the desired location using *Windows Explorer*.
 - 2) Select the Advanced checkbox, and the Directory Name selection box will appear.
 - 3) For Directory Name, select Browse.
 - 4) Navigate to the folder for the database and select it as shown in the following screen shot. There will not be a data folder since it is a new database. The names assigned to the databases in the directory on your system may not match the folder names in the screen shot.
 - 5) Select OK.

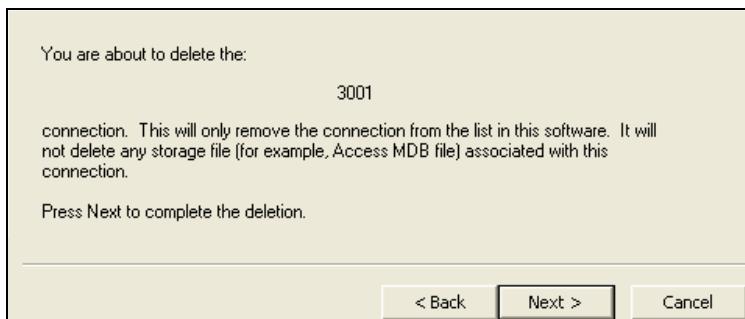


- C. Clear the Log Activity checkbox.
5. Select Next, and the Start dialog box will appear.
6. The Select checkbox is automatically selected. Select Finish to access the newly created database.

Deleting a Database Connection

NOTE → Delete does not remove physical files from the hard drive. Use Windows Explorer to remove the physical files.

1. Exit the instrument software.
2. Select Start on the Windows desktop, select Programs, select LECO, select the instrument, and then select Database Management.
3. Under Connections, select the database connection to remove.
4. Select Delete.
5. Select Next. The Delete dialog box will appear.



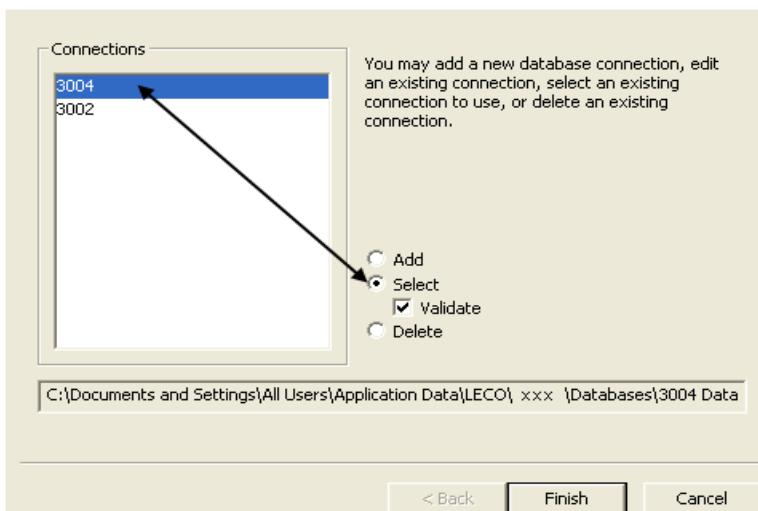
6. Select Next to remove the database connection.

Validating a Database

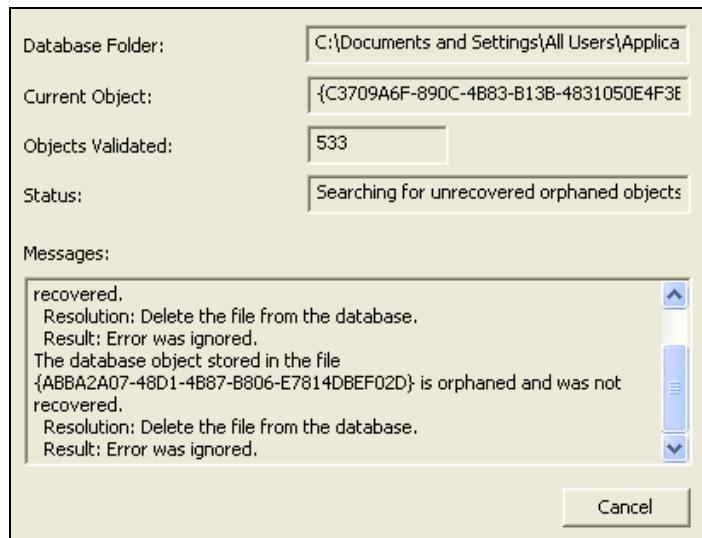
During database validation, the database files will be reviewed for corruption. If orphan objects are found, refer to [Reviewing Orphan Objects](#), page 4–75.

To validate a database:

1. Exit the instrument software.
2. Select Start on the Windows desktop, select Programs, select LECO, select the instrument, and then select Database Management. The Start dialog box will appear.



3. Under Connections, select a database to validate, choose Select, and then select the Validate checkbox.
4. Select Finish. The Database Validation dialog box will display the status of the database validation.

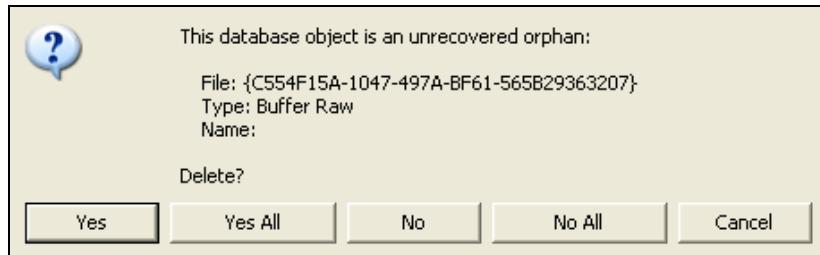


Reviewing Orphan Objects

When orphaned objects or corrupt database objects are discovered, a dialog box such as the one shown as follows will display. It is recommended to select No and review orphaned objects (such as samples, methods, and standards) as they display in the Orphaned Database Object dialog box to ensure that they are valid.

If the database is being validated because database objects are missing, for example samples have disappeared from the spreadsheet, then recover the orphans by selecting No or No All. Select No to be prompted for each orphan, or select No All to recover all orphans without being prompted for each one.

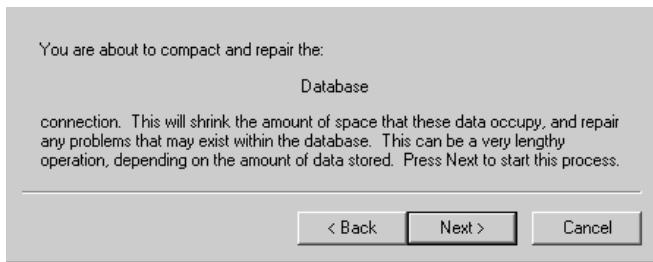
If all samples are displayed in the spreadsheet and there are no apparent problems with the database, then the orphans are likely objects that weren't completely removed from the database when they were deleted, and these orphans can be deleted. Select Yes to be prompted before deleting each orphan, or select Yes All to delete all orphans without being prompted for each one.



Compacting/Repairing a Legacy Database

NOTE → Compact/Repair is available on databases that are not file system databases. For file system databases, the compact/repair selection will not appear on the Start dialog box.

1. Exit the instrument software.
2. Select Start on the *Windows* desktop, select Programs, select LECO, select the instrument, and then select Database Management.
3. Under Connections, select the database to compact/repair.
4. Select Compact/Repair.
5. Select Next and the following message will display.



6. Select Next to compact/repair the database.

Managing Databases for 21 CFR Part 11 Compliance

The following section provides further information about how to create and view log archive databases for 21 CFR Part 11 compliance. For general database topics such as [Using the Start Dialog Box](#) or [Deleting a Database Connection](#), refer to [Managing Databases](#), page 4-67.

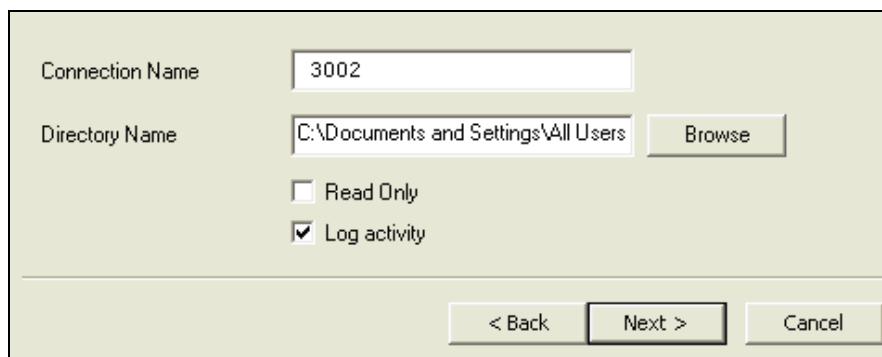
In the software, logging can be enabled to keep a record of all changes as they are made to the database. Logging provides a history of the changes made as well as the current database values.

By default, logging is not enabled. Logging can be enabled or disabled when a database connection is added. Refer to [Enabling Logging for an Existing Database](#), page 4-77, and [Enabling Logging for a New Database](#), page 4-79.

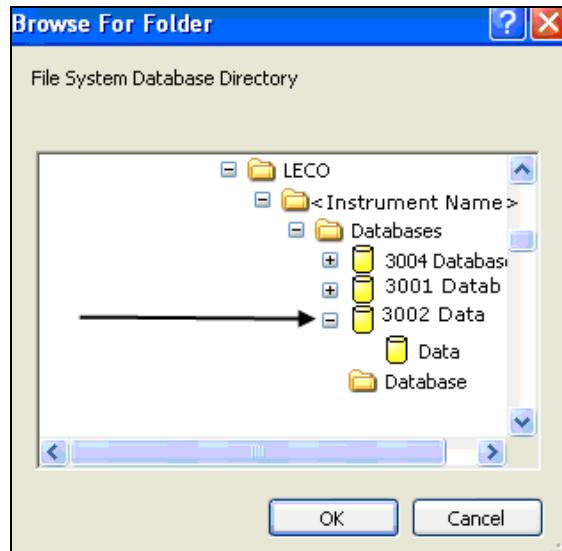
Enabling Logging for an Existing Database

Connecting to an existing database allows you to use an existing file system database, which could be very important in a situation that required a software reinstall such as a system crash. This type of connection provides the means to reconnect to an existing database.

1. Exit the instrument software.
2. Select Start on the *Windows* desktop, select Programs, select LECO, select the instrument, and then select Database Management.
3. In the Start Dialog Box:
 - A. Select Add.
 - B. Select Next.
 - C. Select File System Database - Use Existing.
 - D. Select Next.
4. When the Connect File System Database dialog box appears, enter the information for the desired database as follows:



- A. For Connection Name, enter a name for database connection that will also appear in the Start dialog box in the Connections list.
- B. For Directory Name:
 - 1) Select Browse.
 - 2) Navigate to the folder for the database and select it as shown in the following screen shot. Do not select the Data folder itself. The names assigned to the databases in the directory on your system may not match the folder names in the screen shot.
 - 3) Select OK.



5. If desired, select the Read Only checkbox. When selected, the database information can be viewed but not changed. When the checkbox is cleared, the database can be modified.
6. Select the Log Activity checkbox to turn on logging for any future changes made to the database through the instrument software.
7. Select Next.
8. Select Finish.

Enabling Logging for a New Database

New databases will be file system databases. This database type uses files and folders as its storage media. The size of the database is only limited to the free space on the hard drive.

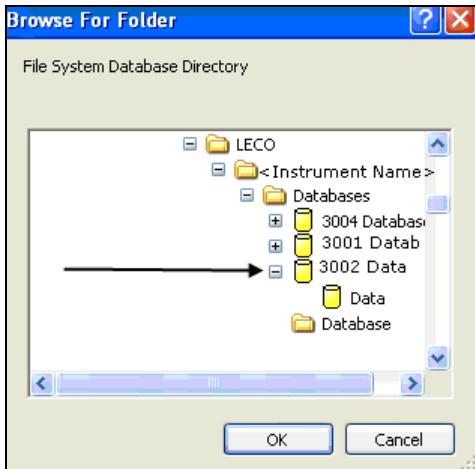
NOTE → To prevent the database from running slow, it is recommended that virus checking of the database directory be disabled. It is also recommended to use NTFS as the hard drive file format.

1. Exit the instrument software.
2. Select Start on the *Windows* desktop, select Programs, select LECO, select the instrument, and then select Database Management.
3. In the Start Dialog Box:
 - A. Select Add.
 - B. Select Next.
 - C. Select File System Database - Create New.
 - D. Select Next.
4. Complete the Create File System Database dialog box as follows:



- A. For Connection Name, enter a name for database connection that will also appear in the Start dialog box in the Connections list.
- B. To use the default location and name for the database folder, proceed to step C. To use another location:
 - 1) Create a folder in the desired location using *Windows Explorer*.
 - 2) Select the Advanced checkbox, and the Directory Name selection box will appear.
 - 3) For Directory Name, select Browse.
 - 4) Navigate to the folder for the database and select it as shown in the following screen shot. There will not be a data folder as it is a new database. The names assigned to the databases in the directory on your system may not match the folder names in the screen shot.

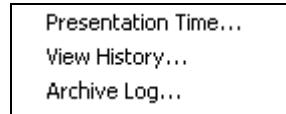
- 5) Select OK.



- C. Select the Log Activity checkbox to turn on logging for changes made to the database through the instrument software.
5. Select Next and the Start dialog box will appear.
 6. The Select checkbox is automatically selected. Select Finish to access the newly created database.

Database Menu

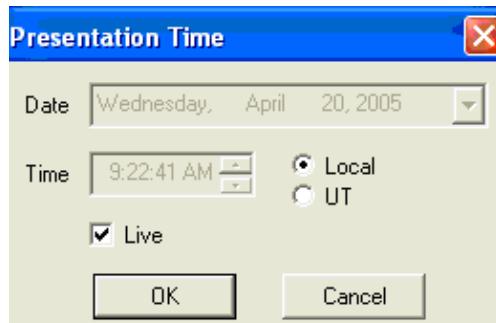
Items on the Database menu in the instrument software will only appear if logging was enabled when the database connection was created. Refer to [Enabling Logging for an Existing Database, page 4-77](#).



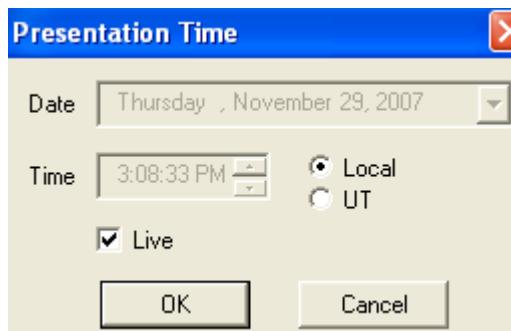
Presentation Time

When logging is enabled for a database connection, the presentation time can be used to view the database as it existed at some previous point in time. For example, it could be used to view results before a change in calibration was performed. While a presentation time is set and the Live checkbox is not selected, changes are not allowed to the database. For example, samples cannot be added and changes cannot be made to methods.

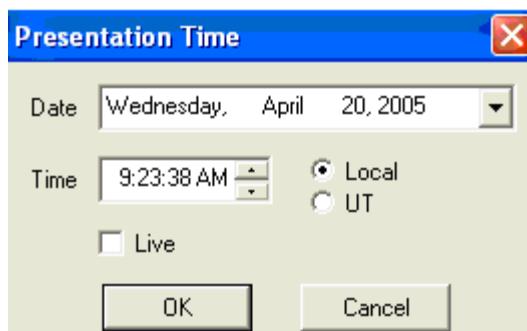
1. Select the Database menu in the instrument software, and select Presentation Time. The Presentation Time dialog box will appear.



- Select the time and date for the presentation time as follows:
Select the Live checkbox to view current information, or clear the Live checkbox in order to select a different date and time.



When the Live checkbox is cleared, Date and Time are active.



- For Date, select the arrow to display a calendar.
- From the calendar, select a date. If desired, select the time, and then select either Local or UT (Universal Time). Local displays the local time zone. UT displays the universal time that corresponds with the UTC (Universal Coordinated Time) as defined by the National Bureau of Standards.
- Select OK. The results as they were at the selected date and time will appear in the spreadsheet.

View History

When logging is enabled for a database connection, View History displays a log of database changes that could be used to identify the time/date when some particular change took place. It can only be used to identify who made a change because there is no description of what each change represents.

- Select the Database menu in the instrument software and select View History. The View Log dialog box will appear.
- The log items that appear in the View Log dialog box are explained as follows.

Date/Time displays the date and time that the database change occurred.

Entry ID displays a unique identifying number for the database object that was changed. For example, each sample would have a unique number.

Action displays Created, Modified or Deleted to indicate the type of action that occurred.

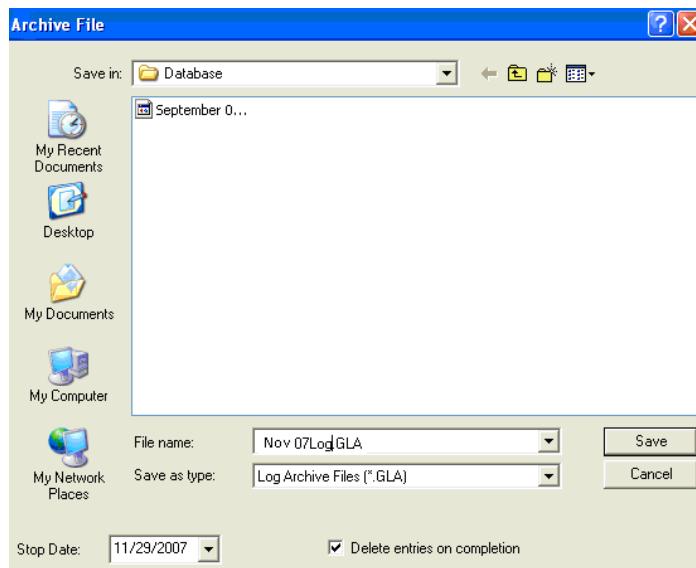
User displays the username of the person who performed the action.

- Select the time zone to use for displaying Date/Time. Local displays the local time zone. UT displays the universal time that corresponds with the UTC (Universal Coordinated Time) as defined by the National Bureau of Standards.

Archive Log

When logging is enabled for a database connection, an Archive Log database can be created to copy log entries to another file and possibly reduce the amount of data stored in the database.

1. From the Database Menu in the instrument software, select Archive Log. The Archive File dialog box will appear.



2. In the Archive File dialog box:
 - A. Select the Delete Entries upon Completion checkbox to delete entries from the database after they are copied to the output file. Clear the checkbox, and entries will not be deleted from the database. Selecting this checkbox reduces the amount of data stored in database files. The file size may not change as a result of this, but space will be made available inside the file for more data to be stored. As a precaution, LECO recommends performing a regular database backup right before using Delete Entries upon Completion. Refer to Creating and Retrieving Database Backups, page 4-69.
 - B. For the Stop Date, select the arrow, and select a date. Any log entries generated on or before this date will be placed into the output file.
 - C. Enter a file name for the log archive database.
 - D. Select the location for the log archive database.
 - E. Select Save.
3. After a log archive database is created, you can create a database connection to the archive log file and view the information in a read-only fashion, which means you can view the log archive database but cannot operate the instrument or analyze samples. Refer to Adding a Connection to a Log Archive Database, following.

Adding a Connection to a Log Archive Database

1. Exit the instrument software.
2. Select Start on the *Windows* desktop, select Programs, select LECO, select the instrument, and then select Database Management. The Start dialog box will appear.
3. In the Start Dialog Box:
 - A. Select Add.
 - B. Select Next.
 - C. Select Database Log Archive.
 - D. Select Next.
4. Complete the Connect Log Archive dialog box as follows:
 - A. For Connection Name, enter a name for database log archive connection that will also appear in the Start dialog box in the Connections list.
 - B. For File Name, Select Browse, and navigate to the log archive file. The log archive file should have a .GLA file extension.
5. Select Next. The Start dialog box will appear.
6. Choose Select and then select Finish.

Removing Results from a Database

When logging is enabled for a database connection, the amount of data stored in the database can become significantly large, and it may become necessary to remove results from the database. Deleting results in the instrument software will only increase the size of the database because the database keeps track of all changes when logging is enabled. The following procedure explains how to remove results from the database for file system databases or for other databases.

For File System Databases

To remove results from a file system database, it is only necessary to create an archive log as explained in the following steps.

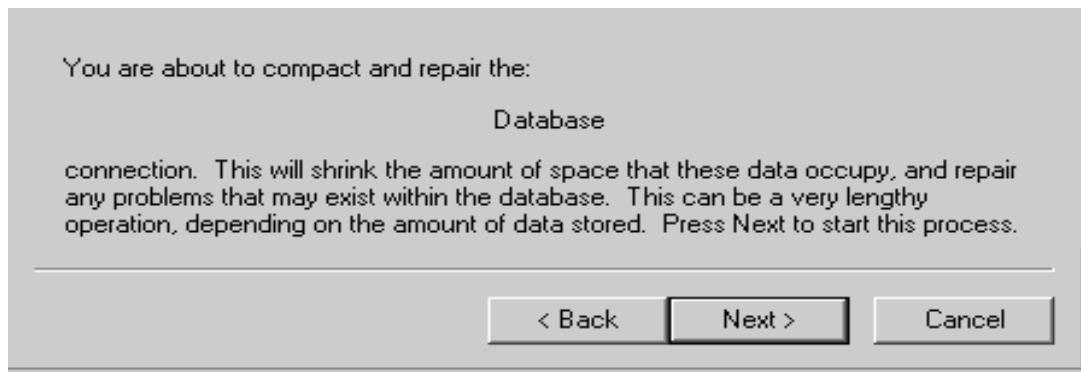
1. Create an archive log by following the steps in Archive Log, page [4-82](#).
2. Exit the instrument software.

For Legacy Databases

For databases that are not file system databases, use the following steps to compact/repair the database and recover the freed up space.

1. Create an archive log that has the Delete Entries Upon Completion checkbox selected by following the steps in Archive Log, page [4-82](#).
2. Exit the instrument software.
3. Select Start on the *Windows* desktop, select Programs, select LECO, select the instrument, and then select Database Management. The Start dialog box will appear.

4. Select the database connection for the database, not the archive log, select Compact/Repair, and then select Next. The following message will display.



5. Select Next to compact/repair the database.

Disabling Logging on an Existing Database

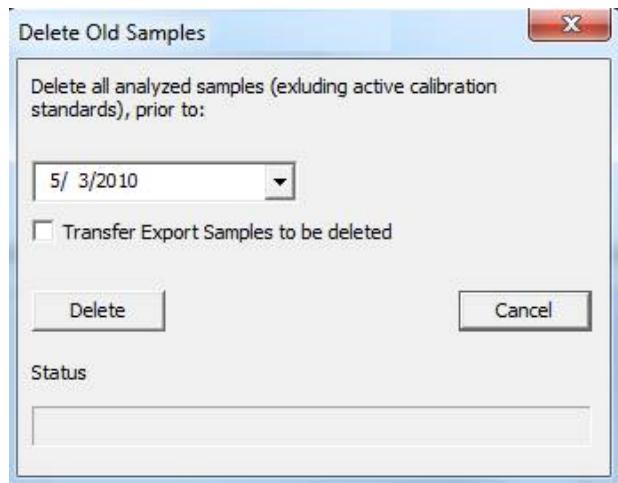
Use the following instructions to disable logging on a database in which logging is enabled.

1. Exit the instrument software.
2. Select Start on the *Windows* desktop, select Programs, select LECO, select the instrument, and then select Database Management.
3. In the Database Start dialog box, select the existing database connection in which you prefer to disable logging. Remember the name of the database and the base file location because you will need this information in order to reconnect to the database in step 8.A, page 4-84.
4. Select Delete, and follow the instructions provided by the software. Refer to Deleting a Database Connection, page 4-74, for further information. The Delete operation will not delete the actual database; it will only remove the database connection name from the list.
5. Return to the Database Start dialog box.
6. In the Start dialog box, select Add, and then select Next.
7. Under Database Types, highlight File System Database-Use Existing, and select Next.
8. Complete the Connect Database dialog box as follows:
 - A. For the Connection Name, enter the same name as the database that was just deleted.
 - B. Enter the Path to the database files.
9. Verify that the checkbox next to Log Activity is blank and select Next.
10. Select Next and the Start dialog box will appear.
11. The Select checkbox is automatically selected.
12. Select Finish.

Deleting Analyzed Samples

The size of the database can be reduced by deleting analyzed samples. This procedure permits the operator to delete analyzed samples by prior date. Analyzed samples can be exported and then deleted by checking a checkbox.

1. Select Database and select Delete by Date.



2. Select the drop-down arrow and enter the prior sample deletion date.
3. If the prior samples to be deleted should be exported and saved before they are deleted, check the Transfer Export Samples to be deleted checkbox.
4. Select Delete to delete the prior analyzed samples or Cancel to cancel deletion.

This page intentionally left blank.

5 Operation

The Operation chapter explains how to prepare the sample for an analysis once the instrument is set up. [First-Time Analysis](#), page 5–5, contains step-by-step procedures that explain how to create a method, log in samples, and perform an analysis.



During installation and operation of this instrument, the ON/OFF switch must be easily accessible.

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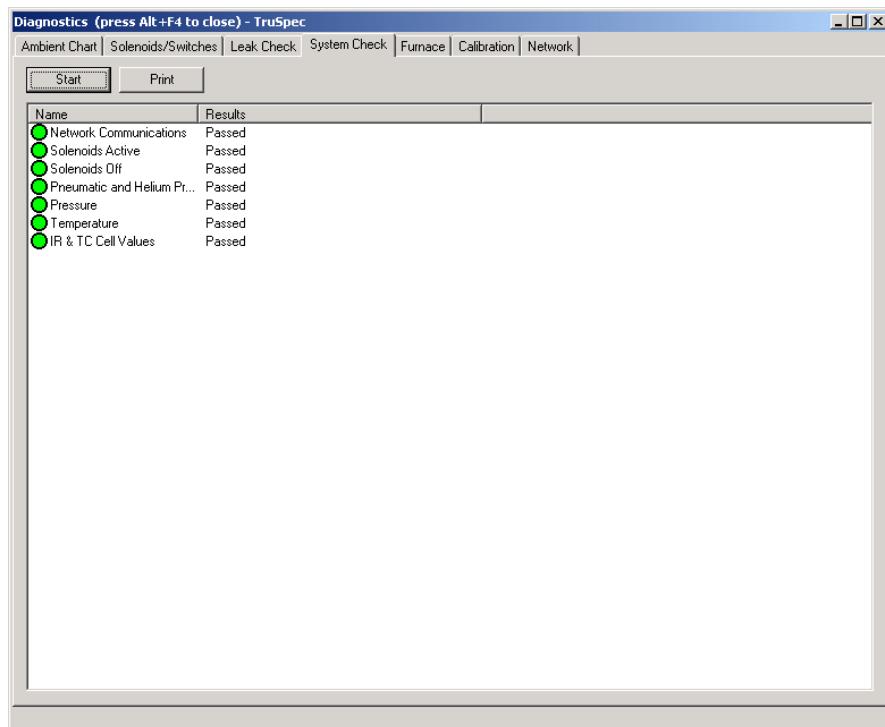
Illustrations

Figure 5-1 Sample Preparation—Microcapsule 5-11

First-Time Analysis

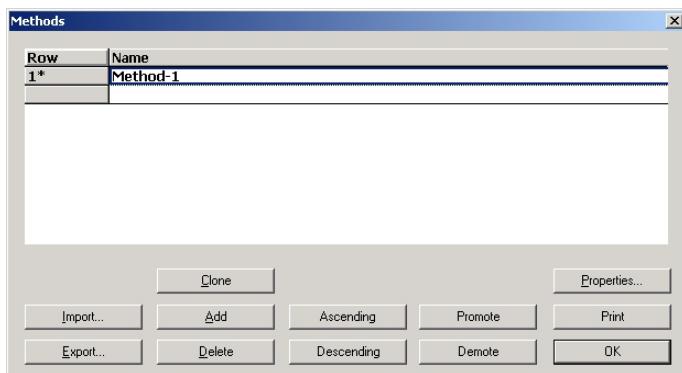
NOTE → The first time the instrument is operated, and any time the software is updated, these steps must be performed in the order in which they appear.

1. Perform a System check before operation to determine if the instrument is operating properly.
 - A. Let the instrument warm up and stabilize.
 - B. From the Diagnostics menu, select System Check.



- C. Check the results of all systems. The circle in front of the system name should be filled in green and in the results column all systems should indicate "Passed".
2. Perform a [Leak Check](#), page 8-14, on both the oxygen and helium systems.

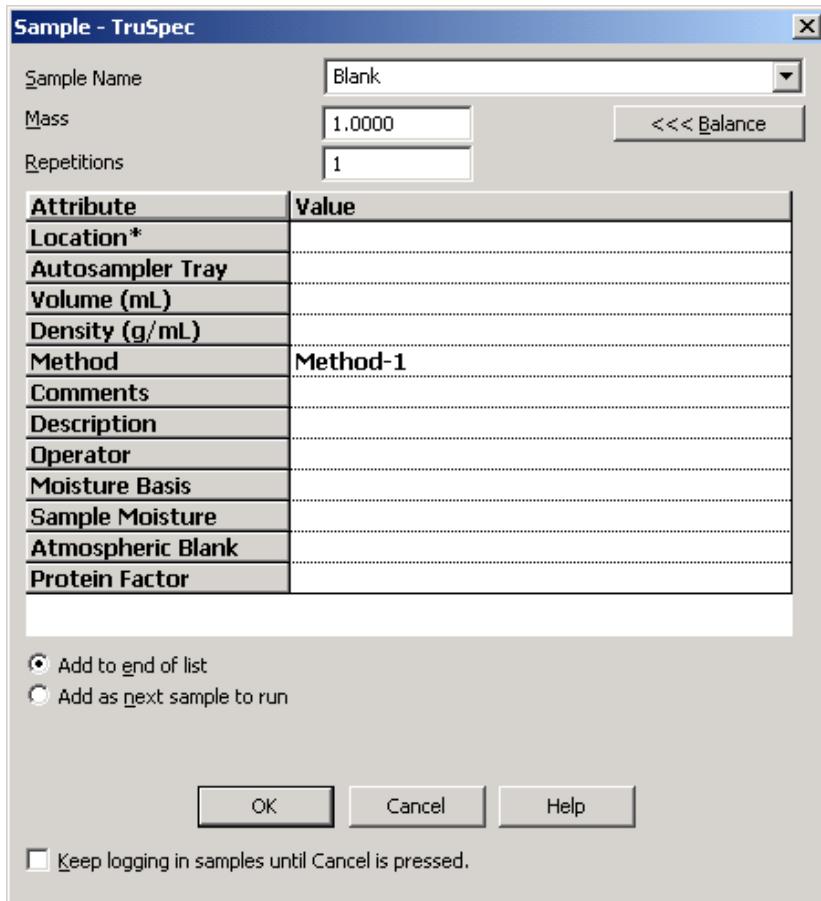
3. Create a method. Refer to [Creating and Modifying a Method](#), page 4–44, for additional information.
 - A. From the Configuration menu, select Method. The Method dialog box will appear.



- B. Select Properties. The Method Properties dialog box will appear.

NOTE → Unless otherwise directed by the LECO Application lab, make sure the method parameters have been set to their default values for the first time analysis.

- C. Select OK to close the Method Properties dialog box.
4. Log in a blank. Refer to [Blank Login](#), page 5–12, for additional information.
- A. From the Samples menu, select Login. The Sample Login dialog box will appear.

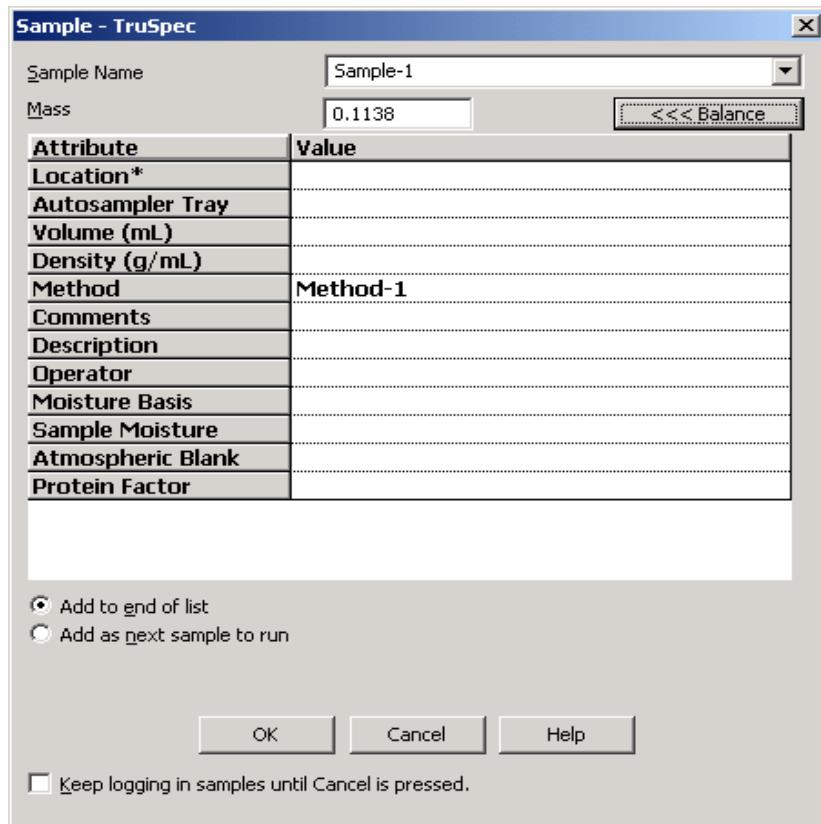


- B. Enter the information required in the dialog box. Refer to Blank Login Definitions, page [5–13](#), for additional
 1. Enter Blank for sample name, 2.000 mg. for sample mass.
 2. Analyze blanks until a plateau is reached. Analyze three to five additional blanks and set blank area using these values.
 - C. Select OK to log in the blank.
 - D. Enter a number one (1) in the Location column on the main spreadsheet. If the Location column is not visible, refer to [Display Configuration](#), page [4–21](#).
5. Analyze a blank. Refer to [Analyzing a Blank](#), page [5–19](#), for additional information.

From the Samples menu, select Analyze. Analysis will automatically start with the first blank.
 6. The blank results will probably start higher, drop slowly, and then stabilize. Highlight the last few blanks analyzed to check the precision. Highlight the entire row for samples selected and view statistics. Statistics should appear in the lower right corner of the screen. The SD of the blank should be 0.002% at 2.0 mg. If the SD precision is acceptable, keep the same blanks highlighted and proceed to the next step.
 7. Perform blank calibration. Refer to Blank Calibration, page [5–26](#), for additional information.
 - A. In the spreadsheet, select the analyzed blanks to set the initial blank calibration value area. These should be the same blanks used in the previous step.
 - B. From the Configuration menu, select Blank. The Blank dialog box will appear with a new blank calibration value. Blank is the raw area of analyte that is subtracted from the raw area every analysis.
 - C. Select OK to enter the new blank calibration value.

8. Log in a standard. Refer to [Sample Login](#), page 5–14, for additional information.

- A. From the Samples menu, select Login. The Sample Login dialog box will appear.



- B. Enter the information required in the dialog box. Refer to [Sample Login Definitions](#), page 5–15, for additional information.

- 1) Enter the sample name of the standard.
- 2) Enter the protein factor when answers are desired as protein (% protein format).

NOTE →

When entering additional standards, it is only necessary to enter the mass. All other analysis parameter values will be automatically entered from the first sample.

- C. Select OK to log in the standard.

9. Analyze a standard. Refer to [Analyzing a Standard](#), page 5–19, for additional information.

From the Samples menu, select Analyze. Analysis will automatically start with the first standard.

10. The answers may not appear accurate although they should be precise. Once standards have been run, select them and view the statistics. For multiple standards of the same weight, the RSD should be <1% or within the certified tolerance of the reference material (whichever is greater).

Accuracy—The amount of measurement deviation from a known accurate comparable source such as a standard calibration sample.

If repeated measurements are accurate, the instrument is precise. If repeated measurements are precise, the instrument is not necessarily accurate; calibration makes the instrument accurate.

Precision—The amount of measurement deviation from one measurement to another without regard to the accuracy or specific value of the measurement. It is the degree of refinement with which an operation is performed or a measurement stated.

11. Although the standards may not be correct, as long as they are close in numbers, the instrument has the precision it needs to continue. Once the instrument is calibrated, it should be both precise and accurate.
12. Perform Calibration. Refer to [Calibration](#), page [5–25](#), for additional information.
 - A. In the spreadsheet, select the Analyzed Standard Samples for Calibration.
 - B. From the Configuration menu, select Calibrations. The Calibrations dialog box will appear.
 - For a calibration at one weight, the curve type selected must be Single Standard Calibration.
 - For a calibration at multiple weights with the same standard, use Linear, Quadratic or Cubic.
 - Refer to step [7](#) (perform blank calibration) for additional information.
 - C. View the calibration curve. Make sure the calibration curve goes through, or comes close to every calibration point. If it does not, select the Curve dropdown box and select another curve type. Refer to Standard Calibration, page [5–27](#), for additional information.
 - D. Select OK to set the new calibration. The Save Calibration dialog box will appear.
 - E. Select OK to enter the new calibration. The new calibration equation and the previous calibration equation will be displayed.
 - F. Select Close.

Calibration is complete. Analyze varying weights of the calibration sample to check the calibration.

Shutdown Procedure

Use this procedure to safely power down and turn Off the instrument.

If Cancel is selected during this procedure, shutdown will be aborted and the furnace temperatures restored to their original settings.

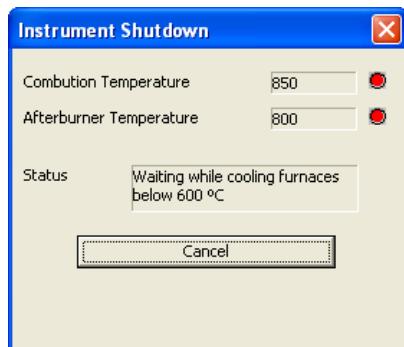
During shutdown, the gas is turned Off.



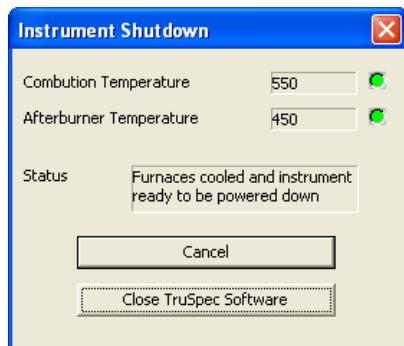
INSTRUMENT DAMAGE

Failure to cool the furnaces prior to turning the power switch OFF will result in overheating of the loading head assembly and possible damage to the furnace.

1. Select Maintenance and select Instrument Shutdown. The Instrument Shutdown screen will appear.



2. Wait until the combustion temperature and afterburner temperature drop below 600°C and the red indicators turn green.



3. Select Close TruSpec® Software to exit the instrument application software.
4. Turn Off the AC power switch.

Sample Preparation *TruSpec Micro*

To prevent contamination, only handle the capsules with forceps.

Crimp capsules on a clean surface such as an inverted beaker.

For micro applications, LECO recommends a 6-place balance.

1. Place the Micro Capsule on the balance using forceps.
2. Press Tare to tare the balance.
3. Add Sample to the microcapsule being careful not to spill any on the balance pan.
4. Remove the Micro Capsule from the balance and crimp as shown in [Figure 5-1](#), page [5-11](#).
5. Place the crimped Micro Capsule on the balance and record the mass. For the *TruSpec CHN*, use Tin Capsules. For the *TruSpec CHNS*, use Silver Capsules.

Tools	LECO Part Number
Tin Capsules (CHN)	601-963
Silver Capsules (CHNS)	502-206
Pliers	601-964
Forceps	619-726
Spatula	619-725

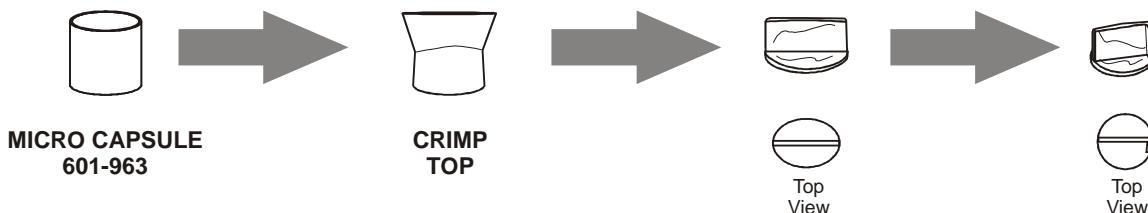


Figure 5-1
Sample Preparation—Microcapsule

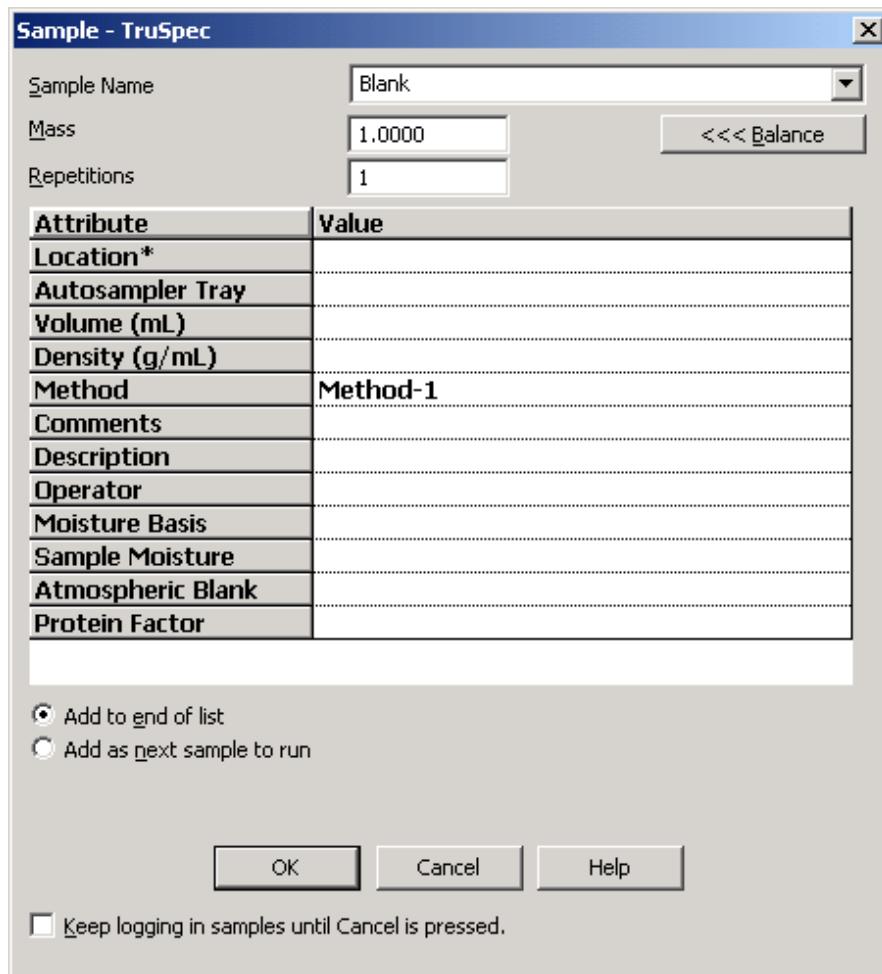
Login

Blank Login

Before a blank is analyzed, a sample named Blank must be entered into the spreadsheet. This procedure is called Blank Login.

An analysis method should be developed before a sample is logged in. Refer to [Creating and Modifying a Method](#), page 4-44.

1. Select Samples and select Login. The Sample Login dialog box will appear.



2. Select the drop-down arrow in the sample name selection box and select Blank from the list.
3. Type the number of blanks repetitions you require.
4. Enter the information required in the Login Screen. Refer to [Blank Login Definitions](#), page 5-13, for additional information.
5. Select OK to log in the blank.

Blank Login Definitions

Sample Name—The name or type of sample. Blank should be entered for sample name. Select the down arrow and select Blank.

Mass—The mass of the blank. A nominal mass equal to the weights of the samples to be analyzed should be entered.

Location—This position should be empty for blank analysis.

Method—The method used for analysis. Select the Down Arrow to select from the list of methods.

Comments—A statement used to explain an operation or procedure. This is an optional entry.

Description—A statement used to explain or identify a sample. This is an optional entry.

Operator—The name of the operator. This is an optional entry.

Moisture Basis—No entry should be made for blank login.

Sample Moisture—No entry should be made for blank login.

Atmospheric Blank—No entry should be made for blank login.

Protein Factor—The value used to calculate a protein result based on a nitrogen analysis. This is an optional entry.

Add to End of List—Check to enter the logged in blank in the last row of the spreadsheet.

Add as Next Sample to Run—Check to enter the logged in blank after the last sample that was analyzed.

Keep Login Samples until Cancel is Pressed—Check this box to log consecutive blanks. The dialog box will reappear after OK is selected. This is an optional entry.

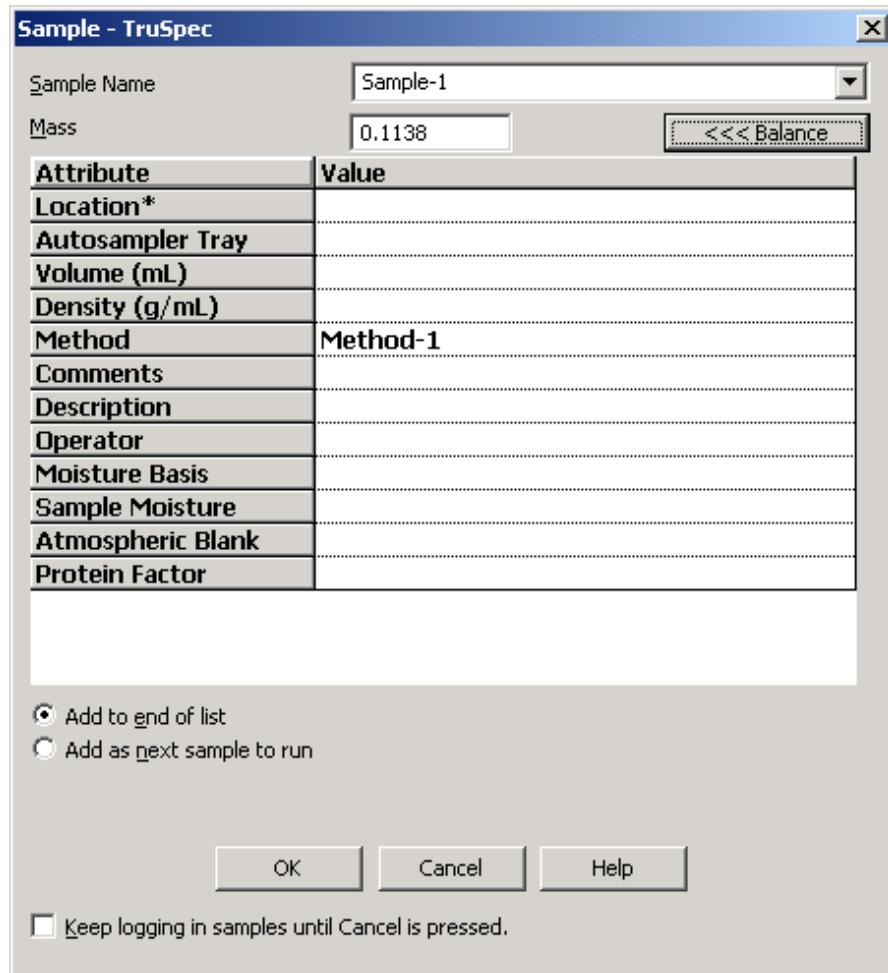
Sample Login

Before a sample is analyzed it must be entered into the spreadsheet. This procedure is called Sample Login. A sample that has been logged in may be named in various alphanumeric notations.

An analysis method should be developed before a sample is logged in. Refer to [Creating and Modifying a Method](#), page 4-44.

Prepare the sample for analysis. Refer to [Sample Preparation TruSpec Micro](#), page 5-11, for additional information.

1. From the Samples menu, select Login. The Sample Login dialog box will appear.



2. Enter the Sample Name in the sample name selection box.
3. Enter the information required in the Login Screen. Refer to [Sample Login Definitions](#), page 5-15, for additional information.
4. Select OK to log in the sample.

Sample Login Definitions

Sample Name—The name or type of sample.

Mass—The mass of the sample. Select Balance to enter a mass from an external balance.

Location—The position in the autoloader where the sample is located.

Method—The method used for analysis. Select the down arrow to select from the list of methods.

Comments—A statement used to explain an operation or procedure. This is an optional entry.

Description—A statement used to explain or identify a sample. This is an optional entry.

Operator—The name of the operator. This is an optional entry.

Moisture Basis—The amount of moisture in the final product. A percentage should be entered. This is an optional entry.

Sample Moisture—The amount of moisture in the sample used to compensate the final result. A percentage should be entered. This is an optional entry.

Atmospheric Blank—Atmospheric Blank compensates the calculation of the final result for the nitrogen content that may be trapped within the sample. A percentage should be entered. This is an optional entry.

Protein Factor—The value used to calculate a protein result based on a nitrogen analysis. This is an optional entry.

Add to End of List—Check to enter the logged in sample in the last row of the spreadsheet.

Add as Next Sample to Run—Select to enter the logged in sample after the last sample that was analyzed.

Keep Logging Samples until Cancel is Pressed—Check this box to log consecutive samples. The dialog box will reappear after OK is selected. This is an optional entry.

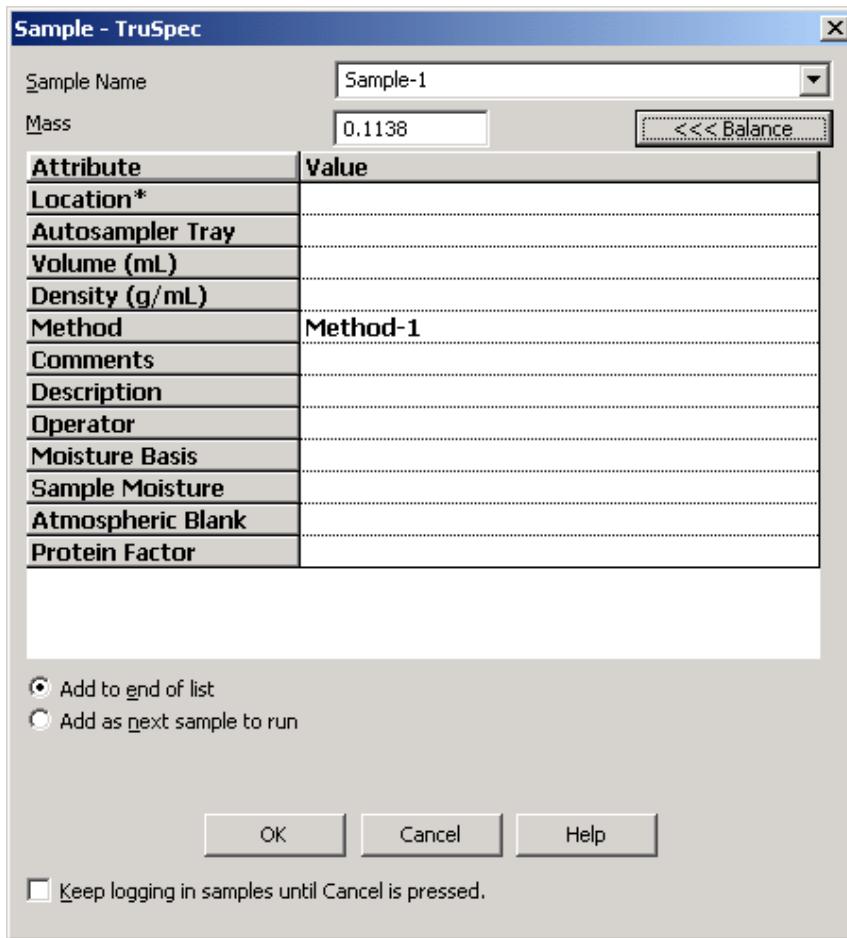
Correct for Moisture

Moisture basis and sample moisture compensates the calculation of the final result for moisture content. They should be entered during sample login.

Moisture Basis—Analysis assumes the sample is analyzed on a dry basis. Moisture basis adds a moisture value during calculation of the final result. When the sample is analyzed, its result is determined with a specific amount of moisture that is not in the sample (on a moisture basis).

Sample Moisture—Sample moisture is the amount of moisture contained in a sample before analysis. The moisture value is subtracted during calculation of the final result. The sample is analyzed "on a dry basis".

1. From the Samples menu, select Login. The Sample dialog box will appear.

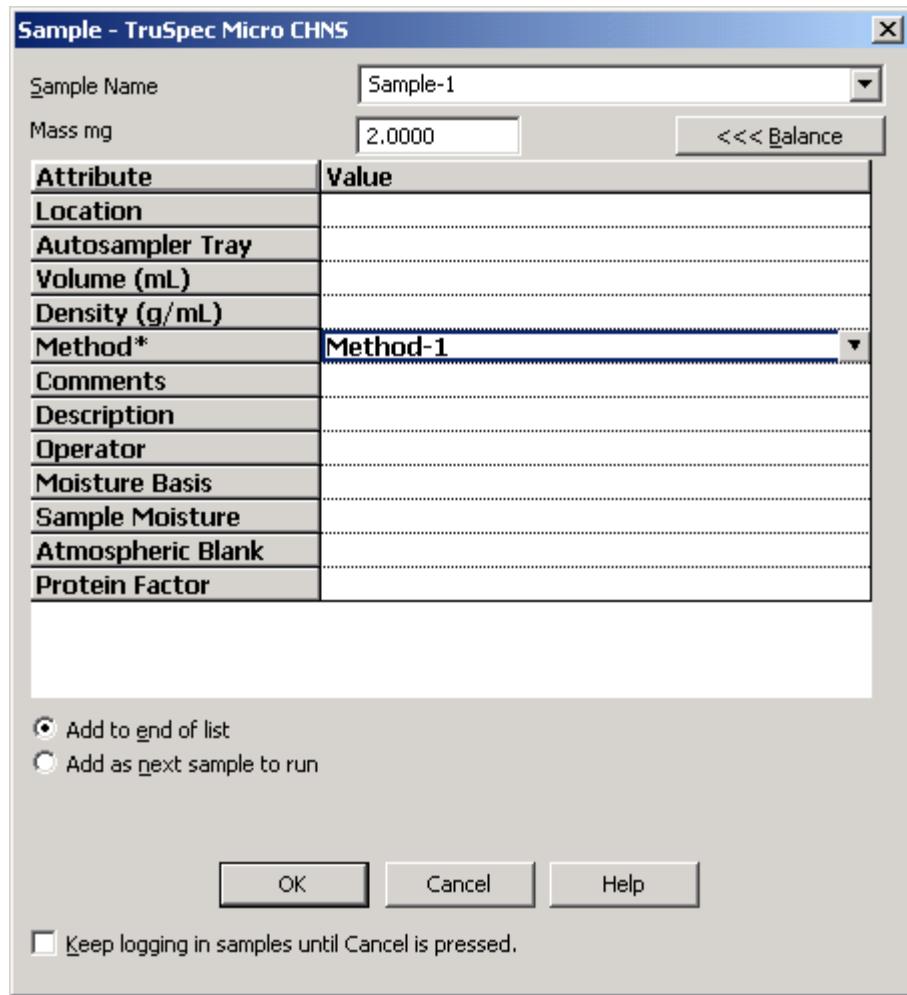


2. Select the Sample Moisture edit box and enter a value.
3. Select the Moisture Basis edit box and enter a value.
4. Select OK.

Correct for Atmospheric Blank

Analysis of powdered samples on the instrument may require sealing the tin foil sample cup before introducing the sample into the instrument. Powdered samples trap atmosphere, which includes nitrogen within the sample. When the tin foil sample cup is sealed atmospheric gas is trapped within the sample. Utilization of the Atmospheric Blank compensates the calculation of the final result for this nitrogen content. The amount of Atmospheric blank should be entered during sample login.

1. From the Samples menu, select Login. The Sample Login Dialog box will appear.



2. Select the Atmospheric Blank edit box and enter a value.

3. Select OK.



If the atmospheric blank was not entered in login, it can still be corrected by entering the value in the spreadsheet during or after analysis and pressing the enter key.

Enter a Mass from the Balance

An external balance must be interfaced with the instrument to enter a mass automatically.

The application must be controlling the balance before a mass can be automatically entered. Refer to [Installing the Balance](#), page 3–5, for more information.

From the Sample Login Screen

Select Balance to enter a weight from an external balance.

Directly into the Spreadsheet

A sample will be added to the first row of the spreadsheet without a value entered for the mass.

1. Place the capsule on the balance.
2. Press Tare.
3. Place the sample in the capsule.
4. Press Print on the balance or select the Samples menu and select Balance. The sample mass will be entered into the first row of the spreadsheet without a mass entry.

Analyzing a Sample

A blank is an analysis that is run without either sample or standard material being burned. Anything that would be used with the sample, except the sample, can be dropped into the furnace during blank analysis. The area of the blank is subtracted from the sample or standard analysis.

Analyzing a Blank

Analyze a Blank permits the operator to run an analysis without burning a sample. This is done in order to obtain data to set the blank area. Refer to Blank Calibration, page [5–26](#), for additional information.

NOTE → Before proceeding, the steps in [Blank Login](#), page [5–12](#), must be completed.

1. Select Analyze (F5). Analysis will automatically start with the first blank.
2. Blank results will be shown in the spreadsheet and plot window.
3. Accept a blank value for all elements in the calibration.

Analyzing a Standard

Analyze a Standard is used to analyze standard samples for calibration.

NOTE → Before proceeding, the steps in [Defining Calibration Standards](#), page [4–55](#), and [Logging in using Calibration Reference Material](#), page [4–56](#), must be completed.

For some applications it may be necessary to use a standard with the same density and/or concentration of sulfur. Consult the LECO Applications Laboratory for further assistance.

LECO recommends using certified reference materials for all calibrations.

1. From the Samples menu, select Analyze and then press F5, or select the F5 analyze button. The next unanalyzed sample will start.
2. After analysis, the sample plot will appear in the window below the spreadsheet. The standard analysis result will appear in the spreadsheet under the element name.

Analyzing a Sample

Sample analysis determines the element concentration in a sample.

- NOTE** → Before proceeding, the steps in [Blank Calibration](#), page 5–26, [Standard Calibration](#), page 5–27, page 5–26, and [Sample Login](#), page 5–14, must be completed.
1. From the Samples menu, select Analyze and then press F5, or select the F5 analyze button. The next unanalyzed sample will start.
 2. After analysis, the sample plot will appear in the window below the spreadsheet. The analysis result will appear in the spreadsheet under the element name.

Aborting an Analysis

An analysis in progress can be aborted. If the analysis is aborted, "Abort" will appear under analysis date.

- NOTE** → Before proceeding, the steps in [Analyzing a Sample](#), page 5–19, must be completed.
- From the Samples menu, select Abort. The analysis in progress will be aborted.

Analyzing Multiple Samples

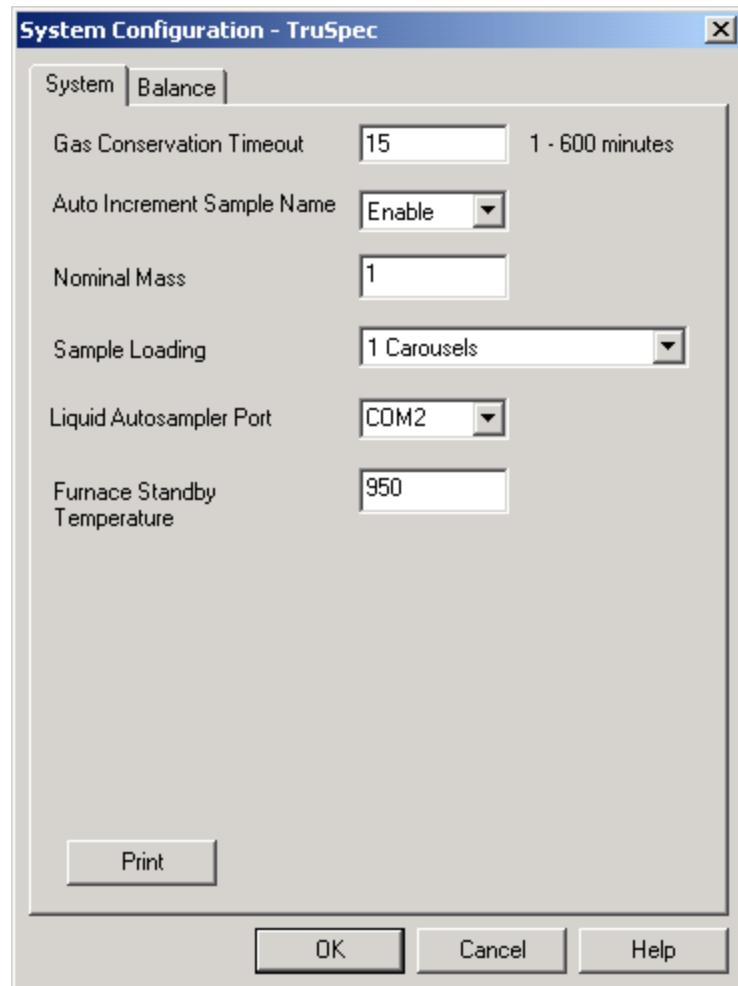
This procedure programs the instrument to analyze a group of samples without the aid of an operator during analysis.

- NOTE** → Before proceeding, the steps in [Creating and Modifying a Method](#), page 4–44, [Blank Calibration](#), page 5–26, and [Standard Calibration](#), page 5–27, must be completed.

Prepare the samples for analysis. Refer to [Sample Preparation TruSpec Micro](#), page 5–11 for additional information.

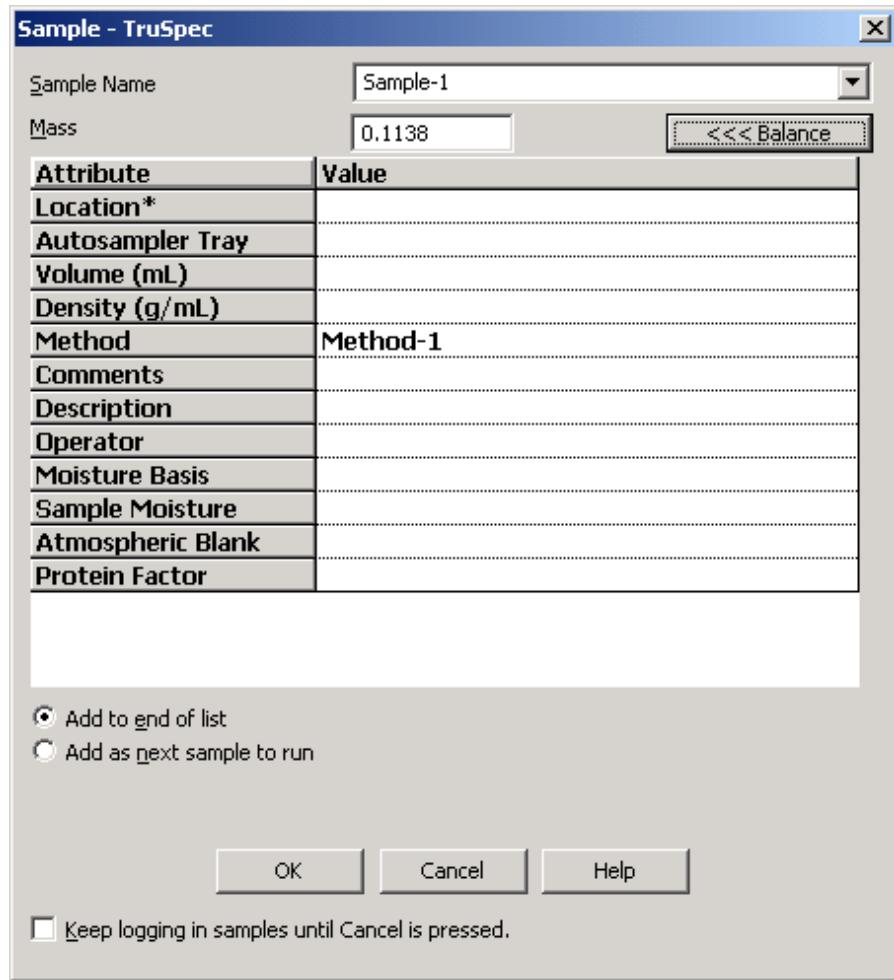
TruSpec CHN(S) Micro—Install and use the 619-704 Carousel Assembly and then load the samples in the proper order for analysis.

1. From the Configuration menu, select System. The System Configuration dialog box will appear.



2. Select Auto Increment Sample Name to advance the sample name by 1. The last character in the sample names must be a number.
3. Select the Carousels drop-down box and select the number of Carousels used for multiple sample analysis. The maximum number that can be selected is 4.
4. Select OK to close the System Configuration dialog box.

5. From the Samples menu, select Login. The Sample dialog box will appear.



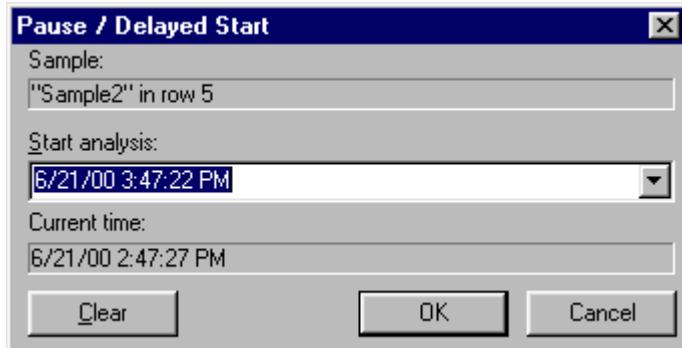
6. Log in a sample to analyze.
7. Select the checkbox at the bottom of the window to keep logging in samples.
8. Repeat step 6 until all samples are logged in.
9. Select Cancel to close the Sample Login dialog box.
10. View the location number of the first sample in the spreadsheet and compare it to the location of the first sample in the carousel. If the location numbers are not the same, select the Location Box of the first sample and enter the carousel location number of the first sample to analyze. The location numbers in the spreadsheet, following the first sample, will change consecutively.
11. From the Samples menu, select Analyze to start the analysis.

Delaying Analysis

Delayed Analysis permits the operator to start an analysis at a later date and time.

An analysis method should be developed before a sample is logged in. Refer to [Creating and Modifying a Method](#), page 4-44.

1. Determine where in the sample list to pause or delay analysis and select the sample. The sample must be an analyzed sample.
2. From the Samples menu, select Pause, or press F7. The Pause/Delay Start dialog box will appear.



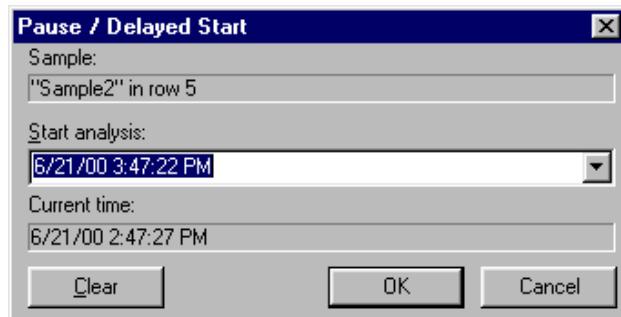
3. In the highlighted field, enter the date and time to start the delayed analysis. The date and time that appears may be edited. The format for entering the date and time is [05/01/2000 4:30:00 PM]. A space should be inserted after the date and time or select Manually if pausing for operator intervention.
4. Select OK to start the delayed analysis. A clock symbol will appear in the spreadsheet next to the sample that will be analyzed at the programmed delayed start time; or, if Manually was selected, a red octagon will appear in the spreadsheet. The analysis will begin only when the operator selects analyze.

Pausing Analysis

Pause Analysis permits the operator to pause analysis at a selected sample and then resume at a programmed date and time. When the programmed time is reached, analysis will continue.

NOTE → Before proceeding, the steps in [Analyzing Multiple Samples](#), page 5–20, must be completed.

1. Determine where in the sample list to pause or delay analysis and select the sample. The sample must be an analyzed sample.
2. From the Samples menu, select Pause. The Pause/Delay Start dialog box will appear.



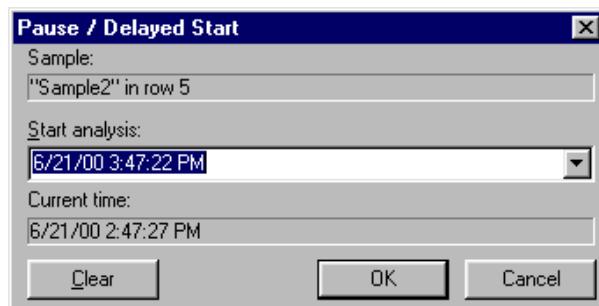
3. In the highlighted field, enter the date and time to restart analysis. The date and time that appears may be edited. The format for entering the date and time is [06/01/2000 4:30:00 PM]. A space should be inserted after the date and time.
4. Select OK to program the pause. A clock symbol will appear in the spreadsheet next to the sample that will be analyzed after the pause.

Cancel Pause

Cancel Pause permits the operator to remove a programmed delay analysis, pause analysis, or hold analysis from the spreadsheet.

NOTE → Before proceeding, the steps in [Analyzing Multiple Samples](#), page 5–20, must be completed.

1. Click and select the row where the delay analysis, pause analysis, or hold analysis is programmed.
2. From the Samples menu, select Pause. The Pause/Delay Start dialog box will appear.



3. Select Clear. The programmed type, delay or pause will be removed.

Calibration

Calibration is the process that adjusts the instrument to produce the correct result when a calibration standard is analyzed. A calibration standard has a known or certified value. First a Blank Calibration is performed, then Standard Calibration and then as daily maintenance both a Blank Calibration and Drift Correction.

Blank Calibration

Blank Calibration is used to calculate the blank or baseline. Sometimes this is called the blank area. Blank calibration calculates the instrument blank and adjusts the area of the analysis accordingly. The system blank should be determined every day by performing a blank calibration before analysis. A blank should be analyzed and the blank calibration set prior to standard calibration or drift correction. Refer to Blank Calibration, page [5–26](#).

Standard Calibration

Standard Calibration is used to calibrate the instrument with known calibration standards. A single point calibration can be performed using the curve type (single standard sample) (at a single mass) however; LECO recommends multipoint calibrations that employ 1/certified weighting. Additionally a blank calibration should be completed prior to performing any calibration. Because Standard Calibration is saved with each method, each method must be calibrated after it is created.

Standard Samples

During the calibration process, samples should be analyzed according to the certificate of analysis, taking into account whether the sample was run as-received or as-determined. Refer to Standard Calibration, page [5–27](#).

Drift Correction

Drift Correction is used to adjust the original calibration response to match the current instrument response. Drift calibration should be performed at the start of every day or when check standards fail to return the proper values. This ensures accurate calibration and analysis results. Refer to Drift Correction, page [5–30](#). LECO recommends that all check standards be independent of the drift standards. After performing a drift correction, the result for the drift standard will be the same result that the drift standard returned during the original calibration (not the certified value).

Replacing Drift Standard

Replace drift is used when a drift standard lot is changed. Replace drift compensates for differences in the drift standard lot and produces a more accurate drift calibration point. Refer to [Replacing Drift Standard](#), page [5–32](#).

Blank Calibration

Blank calibration calculates the instrument blank area and adjusts the analysis area accordingly.

1. Once the system is stable, select Login (F3) and enter the following information into the Sample screen.
 - Enter "Blank" into the Sample Name field.
 - Enter "1" into the Mass field.
 - Enter the desired number of repetitions (3 through 5) in the Repetitions field.
2. Select OK.
3. Select Analyze (F5) to begin the analysis.
4. Once the blanks have been analyzed, highlight the last three to five rows (depending on what number was entered into the Repetitions field), select Configuration, and then select Blank from the drop-down menu.
5. The Method Blank screen will appear, showing the current blank settings and the new blank settings. The software displays the data in blue to alert the operator that the data has changed. Refer to the following screen shot.

The screenshot shows a Windows-style dialog box titled "Method-1 Blank". The dialog contains a table with columns: Row, Action, Element Range, New, Current, and L. There are three rows: Row 1* has Action "Include" and Element Range "Nitrogen" with New value 1.7312 and Current value 0.0000; Row 2 has Action "Include" and Element Range "Carbon" with New value 2.2753 and Current value 0.0000; Row 3 has Action "Include" and Element Range "Hydrogen" with New value 269.89 and Current value 0.0000. At the bottom are buttons for "Include / Exclude", "OK", and "Cancel".

Row	Action	Element Range	New	Current	L
1*	Include	Nitrogen	1.7312	0.0000	
2	Include	Carbon	2.2753	0.0000	
3	Include	Hydrogen	269.89	0.0000	

6. Include or exclude an element by selecting a row to select the element and selecting Include/Exclude. The action box will indicate if the element is included or excluded. If the element is included, a blank calculation will be calculated for that element.
7. Select OK.

NOTE →

All samples analyzed after the blanks are set will reflect the new blank factor. If samples were analyzed before blanks were set, samples will need to be recalculated with the new blank.

Standard Calibration

Standard Calibration is a process that adjusts the response of the instrument to that of known standards. The application software permits two different types of calibration: Single Standard or multipoint calibration. Because calibration is saved with each method, each method must be calibrated after it is created.

- NOTE** → Refer to [Standard Calibration Definitions](#), page 5–29 when performing this procedure.

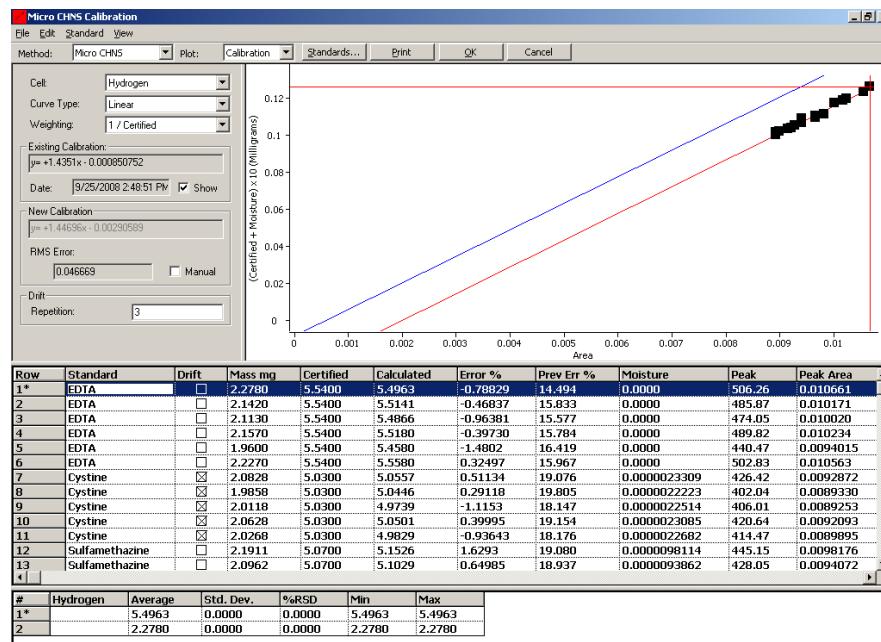
The instrument Blank should be calibrated before performing standard calibration. Refer to Blank Calibration, page 5–26.

LECO recommends multipoint calibrations that employs 1/certified weighting be used for standard calibration.

Moisture is an optional entry for hydrogen and oxygen analysis. Moisture must be determined before analysis and logged in as Sample Moisture. Calibration will be compensated for moisture content. Refer to [Sample Login](#), page 5–14.

New Standard Calibration

1. Log in and perform at least three standard analyses.
2. Select the results of the standard analyses from the spreadsheet.
3. Select Configuration and select Calibrations.
4. From the fly-out menu, select New. The Calibration screen will appear.



5. Select the arrow in the drop-down box and Select a Cell (detector) to calculate a calibration for. A separate calibration can be calculated for each cell.
6. Select the arrow in the drop-down box and select a Curve Type. LECO recommends multipoint linear or higher order curves.
7. View the curve displayed on the graph. It should intersect the black squares which represents the standards. The curve fit can also be evaluated by selecting a Relative Error plot on the residual error plot.

8. Select the arrow in the drop-down box and select the desired weighting. LECO recommends 1/certified weighting be used for a standard calibration.
9. Select OK to select the cell to calibrate. One or more cells can be selected.
10. Select Print to print a copy of the calculated calibration on the system printer.
11. Select OK to exit the calibration procedure and save the calibration curve.
12. In the next dialog box, highlight the cells that you wish to save the calibration for and select OK. The calibration is saved and associated with the method used to analyze the standards.

Add Standards

Add standards permits the operator to add analyzed standards to the list of standards used for calibration.

1. Select analyzed standard samples from the spreadsheet to be added to the list of standards used for calibration.
2. Select Configuration and select Calibrations.
3. From the fly-out menu, select Add Standards.
4. The highlighted Analyzed Standards will be added to the list of samples used for calibration. To view the list of standard samples, select new from the calibrations fly-out menu.

View Calibration

Permits the operator to view the current calibration. The calibration cannot be changed from this screen.

1. Select Configuration and select Calibrations.
2. From the fly-out menu, select View Calibration.
3. The Calibration screen will appear. The screen will be the same as new calibration, except most of the selections will not be available.

Edit Calibration

Permits the operator to view and edit the current calibration.

Standard Calibration Definitions

Cell Type—Selects the measurement cell that will be associated with the calibration curve. In this case only sulfur can be selected.

Curve Type—Selects the type of calibration curve. Select a curve that intersects each calibration result.

Weighting—Determines which calibration results, on the calibration curve, get priority.

- **Normal**—Each point gets equal priority.
- **Manual**—A manual weighting can be entered.
- **1/Certified**—A weighting factor that can be applied to the calibration data points. This will counteract a bias for higher concentrations that develops naturally from the curve fitting process.

Show—Select Show to show the last calibration. The last calibration will appear on the graph in blue.

Manual—Select Manual to enter a new calibration equation. This can be done if a calibration was lost and a previous calibration recorded.

RMS Error (Root Mean Square)—A method of quantifying the dispersion or spread of data. It is used in the PC software to determine which calibration curve is a better fit. The lower the RMS error, the better the fit.

Zoom In—Draw a box around a calibration point to zoom in.

Zoom Out—Select on a calibration point with the right mouse button. A Zoom Out button will appear. Select the Zoom Out button to zoom out.

Drift Correction

Drift Correction is used to adjust the original calibration response to match the current instrument response. Drift calibration should be performed at the start of every day or when the check standard doesn't return the correct result. This ensures accurate calibration and analysis results.

After calibration, a Standard in the center of the calibration range will be automatically selected (with a tolerance of $\pm 12.5\%$) to be the drift standard.

A different Drift Standard can be manually selected from the standard calibration screen. Refer to Standard Calibration, page 5-27, for more information.

A Blank Calibration should be performed before every Drift Correction. Refer to Blank Calibration, page 5-26, for more information.

The Drift Standard should be homogenous and return precise results.

Check Standards should be independent of the drift standard.

The Drift Standard and the Samples to be analyzed should be in the center of the calibration curve.

1. Select Samples and then select Login Drift Sample.
2. Select Drift Standards and then select the Drift Standard to log in. The drift standard must be within the specified mass range.
3. Perform a standard analysis.
4. Select the result of the standard analysis from the spreadsheet.
5. Select Configuration and select Drift. The fly-out menu will appear.
6. From the fly-out menu, select Drift. The Calibration screen will appear.

NOTE → In the following screen shot, the software displays the data in blue to alert the operator that the data has changed.

The screenshot shows a Windows-style dialog box titled "Method Drift". It contains a table with five columns: Row, Action, Detector, New, and Current. The rows represent three elements: Carbon, Nitrogen, and Hydrogen. The "Action" column shows "Include" for all three. The "Detector" column lists the element names. The "New" column contains numerical values: 0.98409 for Carbon, 1.0083 for Nitrogen, and 151.02 for Hydrogen. The "Current" column also contains numerical values: 1.0000 for Carbon, 1.0000 for Nitrogen, and 46.550 for Hydrogen. The "New" values for Carbon and Nitrogen are highlighted in blue, indicating they have been modified. At the bottom of the dialog are buttons for "Include / Exclude", "OK", and "Cancel".

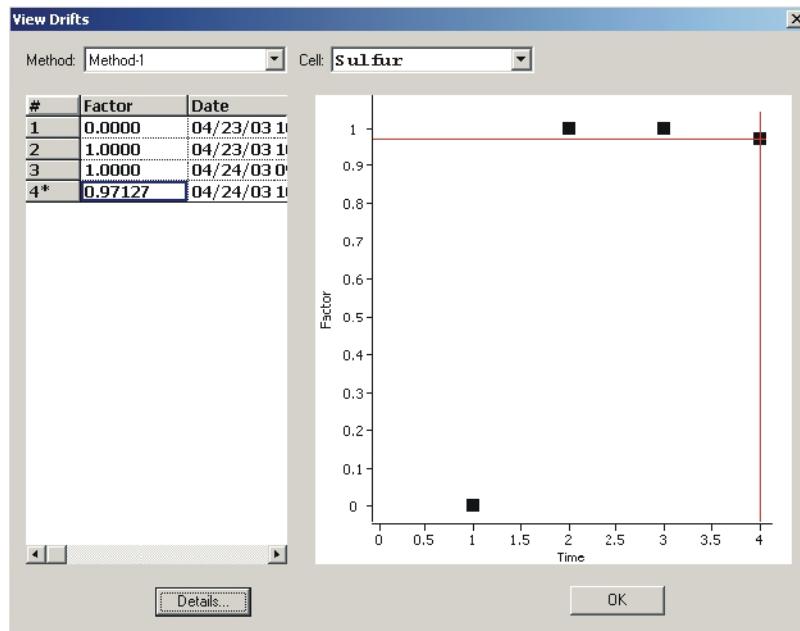
Row	Action	Detector	New	Current
1*	Include	Carbon	0.98409	1.0000
2	Include	Nitrogen	1.0083	1.0000
3	Include	Hydrogen	151.02	46.550

7. Include or exclude an element by selecting a row to select the element and selecting Include/Exclude. The action box will indicate if the element is included or excluded. If the element is included a drift calculation will be calculated for that element.
8. Select OK to calculate the drift based on the analysis result obtained in step 1.
 - If more than one drift standard is selected, the drift factor will be the average of the selected standards.
 - After a drift correction, the drift standard results will match the result from the drift standard used in the original calibration curve not the certified value.

Viewing History

View History plots past drift corrections on a graph. The operator or lab manager can use this information to determine instrument stability. After a pattern is determined, the operator can watch for this. If a sudden change in this pattern occurs it might indicate a potential problem with the instrument.

1. Select Configuration and select Drift. The fly-out menu will appear.
2. From the fly-out menu, select View History. The View History screen will appear.



3. Select the Method drop-down arrow to select the method. Drift calibration history for each method can be viewed.
4. Select the Element drop-down arrow to select the detector. Drift calibration history for each detector can be viewed.
5. Select Details to view the last drift calibration values.
6. Select OK to exit the screen.

Replacing Drift Standard

Replace Drift Standard is used when the drift standard currently being used for Drift Corrections is in short supply and the new replacement drift standard is a different lot number with a slightly different known value. Replace Drift Correction should be used to compensate for these differences and produce a more accurate calibration.

- NOTE** → This procedure must be completed before the current drift standard has been consumed.

A Drift Correction must be performed prior to completing the proceeding Replace Drift Standard procedure. This ensures that the detector response from the current drift standard can approximate the detector response from the replacement drift standard.

1. Select the current calibration standards.
2. Select Configuration then select Drift.
3. Select Samples and then select Recalculate.
4. Define a new standard for the new lot. Refer to [Add Standards](#), page 5–28.
5. Perform an analysis with the new standard defined in step 4.
6. Select the standard sample analysis result from step 5.
7. Select Configuration and select Drift.
8. Select Replace Drift from the fly-out menu.
9. A dialog box will appear. Select the Drift standard to replace.



10. Select the drift standard to replace then select OK. The new drift Standard is selected as the drift standard.
11. Select the new drift standard just analyzed from the spreadsheet.
12. Select Configuration from the configuration menu and then select Drift.

13. Select drift from the fly-out menu. The drift calibrations screen will appear.

Row	Action	Detector	New	Current
1*	Include	Carbon	0.98409	1.0000
2	Include	Nitrogen	1.0083	1.0000
3	Include	Hydrogen	151.02	46.550

14. Include or exclude an element by selecting a row to select the element and selecting Include/Exclude. The action box will indicate if the element is included or excluded. If the element is included, a drift calculation will be calculated for that element.
15. Select OK to calculate the drift based on the analysis result obtained in step 5.

Samples

Sample Editing Functions

Insert a Sample

If a sample is going to be added to the last row of the spreadsheet, sample login should be used. If a sample should be inserted out of sequence, between unanalyzed samples, Insert a Sample should be used.

NOTE → An analysis method should be developed before a sample is logged in. Refer to [Creating and Modifying a Method](#), page 4–44.

1. Select and select a row in the spreadsheet after the last analyzed sample. Insert will insert a row before the selected row.
2. From the Edit menu, select Insert. A row will be inserted into the spreadsheet before the selected row.

Filling Cells with the Same

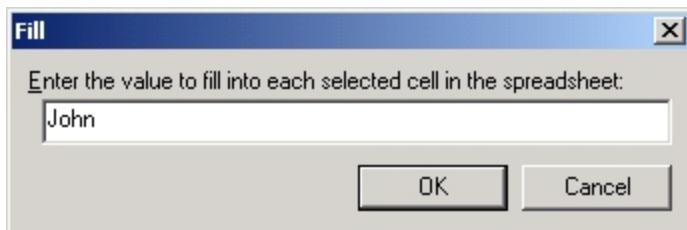
A group of cells in the spreadsheet can be quickly filled with the same data. As an example, the method could be changed in a group of logged in unanalyzed samples.

1. Click and drag the mouse pointer to select the cells to fill with the same data.

In the following example, the mouse pointer was dragged over the Operator cells to be filled with the same operator's name.

Row	Name	Operator	Method
1*	Sample-1		Method-1
2	Sample-1		Method-1
3	Sample-1		Method-1
4	Sample-1		Method-1

2. From the Edit menu, select Fill. The Fill screen will appear.



3. Enter the data to fill into each selected cell.
4. Select OK.

Cut

NOTE

Cut is used to remove a sample from the spreadsheet and copy it to the Microsoft® Windows® Clipboard. From there, it can be pasted into another location in the spreadsheet.

1. Select a sample by selecting a row in the spreadsheet. The row should be highlighted.
2. Select the Edit menu and select Cut. The sample will be removed and cut to the clipboard.

Copy

NOTE

Copy is used to copy a sample from the spreadsheet and copy it to the *Windows* Clipboard. From there it can be Pasted into another location in the spreadsheet.

1. Select a sample by selecting a row in the spreadsheet. The row should be highlighted.
2. Select the Edit menu and select Copy. The sample will be copied to the clipboard.

Paste

NOTE

Paste is used to copy a sample that was cut or copied to the *Windows* Clipboard and insert it into the spreadsheet.

1. Select a sample location in the spreadsheet by selecting a row. The row should be highlighted.
2. Select the Edit menu and select Paste. The sample will be copied to the spreadsheet.

Deleting a Sample

Use Delete a Sample to remove a sample row from the spreadsheet.

1. Select a row in the spreadsheet to delete. If more than one row should be deleted, click and drag the mouse pointer down the desired number of rows to delete. More than one row will be selected.
2. From the Samples menu, select Delete.
3. Select Yes to delete the row or rows of sample information. The selected sample information will be deleted from the spreadsheet. It is not possible to restore this data once it's deleted.

NOTE

If a database is created with log activity enabled, a deleted sample can be viewed by setting the Presentation Time to a time prior to the deletion.

Recalculating Results

1. Select the samples in the spreadsheet to recalculate.
2. From the Samples menu, click Recalculate. The selected samples will be recalculated using the new calibration.

NOTE

Results are automatically recalculated when a field in the spreadsheet is edited. (Example: name, mass, method, analysis date, etc.).

If the calibration is changed, it can be reapplied by following the previous procedure.

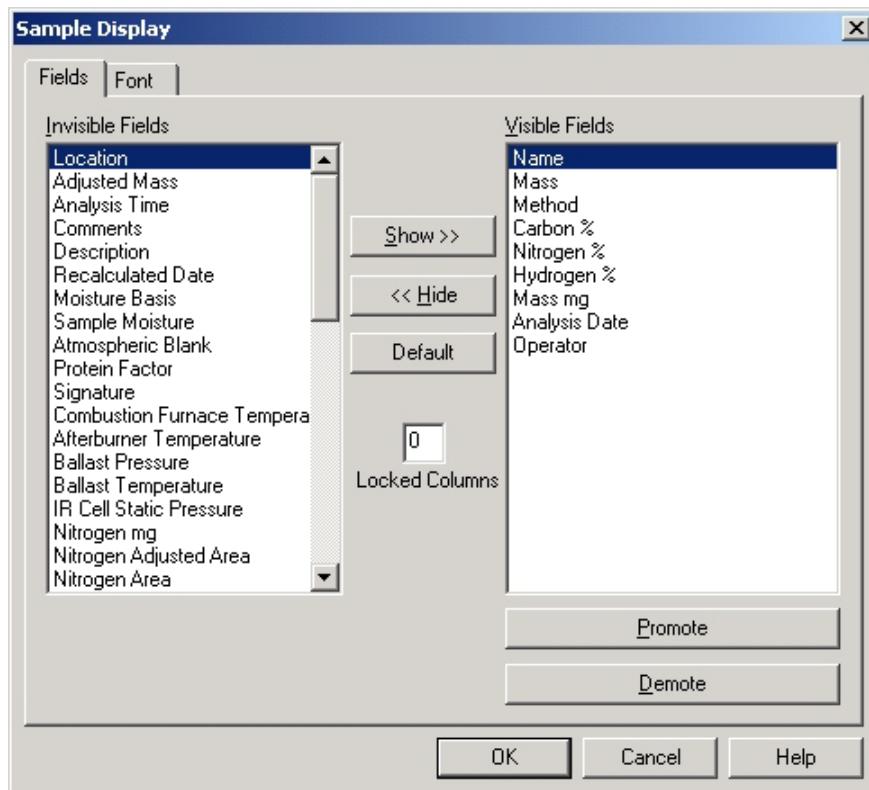
Display Protein Results

The nitrogen analysis results can be displayed as percent protein.

NOTE → A protein factor may be defined during login. Make sure a factor has been defined. Refer to [Typical Protein Factors](#), page 5–36.

A protein factor may be entered in the spreadsheet if the field is visible.

- From the Configuration menu, click Display. The Sample Display dialog box will appear.



- Select Protein % from the Invisible Fields edit box.
- Select Show to move protein % from the Invisible Fields to the Visible Fields edit box.
- Select OK to display protein % and protein factor in the spreadsheet.

Typical Protein Factors

Product	Protein Factors
Wheat Products	5.70
Almonds	5.18
Peanuts	5.46
Tree Nuts	5.30
Coconuts	5.30
Dairy Products	6.38
Other Products	6.25

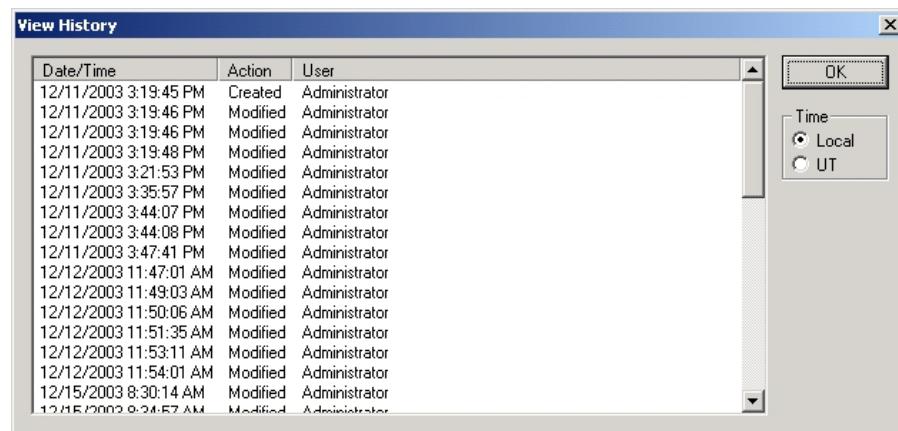
Viewing History

View History permits the operator or laboratory manager to look at a history log of the actions performed on a selected sample.

1. Select a sample in the spreadsheet to View History of.

8	Feed	1.0150	General	2/10/2003 3:30:39 PM	0.00257	0.00173
9*	Feed	1.0050	General	2/10/2003 3:35:40 PM	0.00256	0.00206
10	Feed	0.9980	General	2/10/2003 4:10:40 PM	0.00255	0.00206

2. Select the Samples menu and select View History. The View History screen will appear. Refer to [View History Definitions](#), following.



3. Select the Local Time button, in the Time screen, to display the time in local 12-hour time.
4. Select the UTC button, in the Time screen, to display the time in Universal Coordinated Time.
5. Select OK to exit view history.

View History Definitions

Date and Time—The date and time the action took place.

Action—The type of action performed on the sample. Examples are: Created the sample, modified the sample, and recalculated the sample.

User—The Operator that performed the action.

Sample Signature

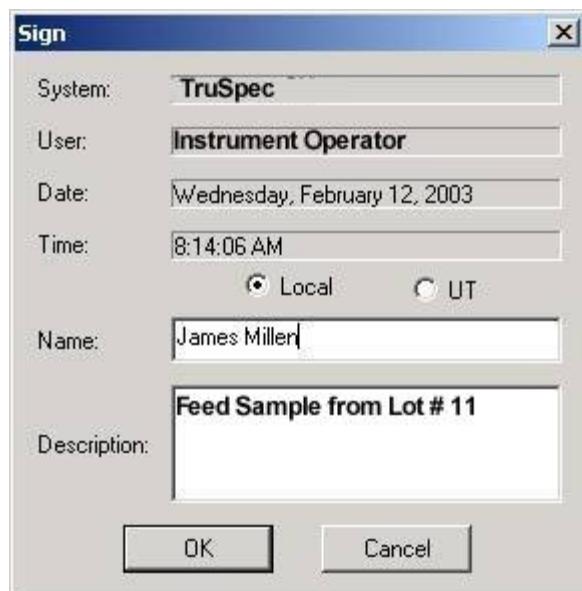
A signature confirms that a user has accepted the sample information displayed in the spreadsheet. Any change to the sample information after it is signed will clear the signature. The signature can be used to ensure that the validity of the sample information has remained the same since it was signed.

To view a sample signature, after it has been signed, refer to Viewing Signatures, page 5-39.

1. Select a row in the spreadsheet to select a sample to sign.

8	Feed	1.0150	General	2/10/2003 3:30:39 PM	0.00257	0.00173
9*	Feed	1.0050	General	2/10/2003 3:35:40 PM	0.00256	0.00206
10	Feed	0.9980	General	2/10/2003 4:10:40 PM	0.00255	0.00206

2. Select the Samples menu and select Sign. The Sign screen will appear.



- A name will appear in the Name Entry box. It will be the name of the logged-on *Windows* user. If desired the name can be changed. It's suggested that the current operators name be used.
- If desired, a description can be entered in the Description Entry box. This can be additional information about the sample or an event that took place. Any text can be entered.
- To display the time in local 12-hour time, select the Local button. To display the time in Universal Coordinated Time, select the UT button.
- Select OK to enter the signature.

NOTE → The system name, user name, date, and time are obtained from the *Windows* operating system. They cannot be changed from this screen.

Viewing Signatures

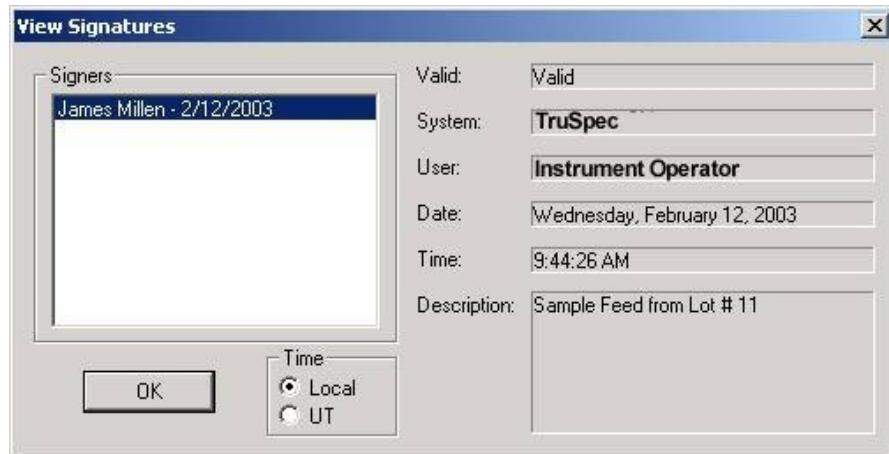
View Signatures permits the operator or laboratory manager to view a sample signature and determine if it is valid. A sample must be signed before the signature can be viewed. Refer to Sample Signature, page 5-38.

NOTE → If information associated with the sample was changed after it was signed, the signature will be cleared and the view signatures screen will not appear in step 2.

1. Select a row to select a sample from the spreadsheet to view.

8	Feed	1.0150	General	2/10/2003 3:30:39 PM	0.00257	0.00173
9*	Feed	1.0050	General	2/10/2003 3:35:40 PM	0.00256	0.00206
10	Feed	0.9980	General	2/10/2003 4:10:40 PM	0.00255	0.00206

2. Select the Samples menu and then select View Signatures. The View Signatures screen will appear.



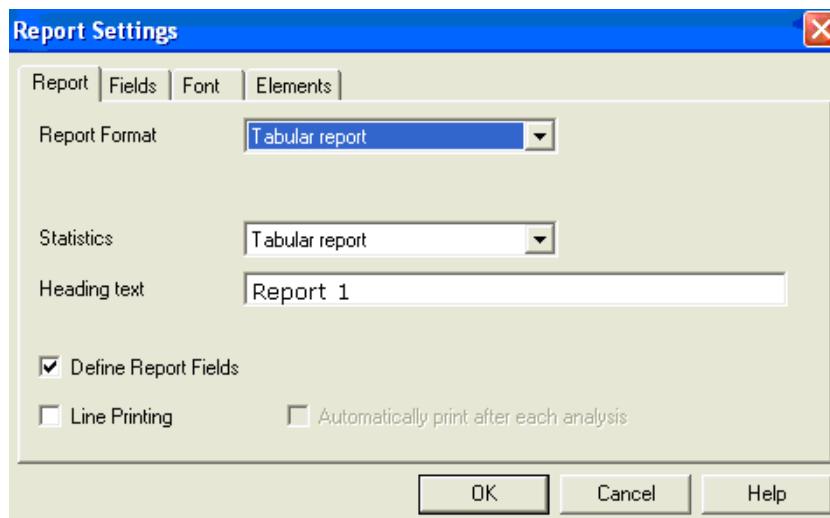
3. Select OK when finished viewing the signature information.

Printing Reports

Configuring Report Before Printing

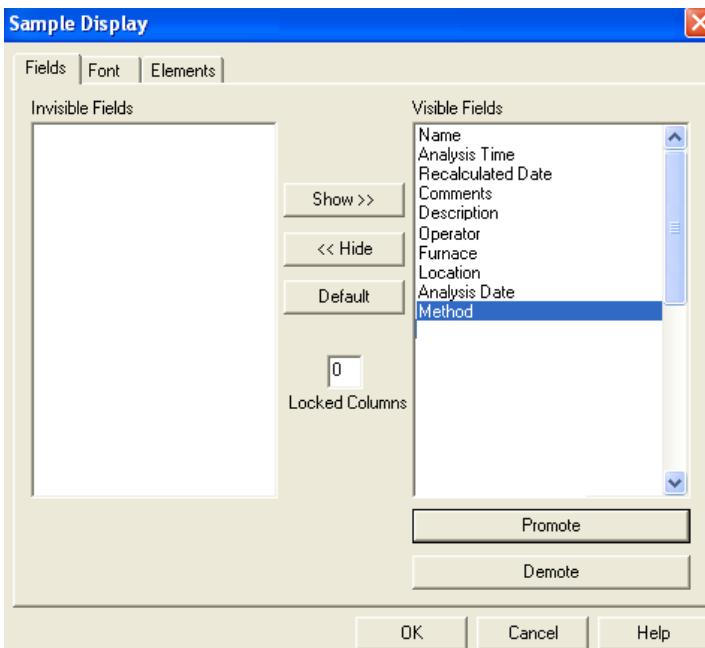
A report of analysis results can be generated and printed on the system printer. The following section explains how to use the Report Settings dialog box to determine the format of the report.

1. In the spreadsheet, select the samples as follows:
 - A. Place the cursor in the column under row until a black arrow displays.
 - B. Hold down the right mouse key and drag the mouse over the desired samples.
 - C. Unclick the mouse. Selected samples appear highlighted in blue.
2. Select Samples and select Print Preview. Select Print Preview to access the Report Settings dialog box in order to preview how selected samples will print on the system printer. The Report Settings Screen will appear.
3. Configure the report by selecting the Report tab, Field tab, Font Tab, and Element tab and by entering the desired settings as explained in the following steps. The Fields tab will only appear when Define Report Fields is checked on the Report tab.



4. On the Report Tab:
 - A. Select the arrow next to Report Format to determine the format of the report.
 - Select Report with Plots to display a report with data plotted.
 - Select Tabular Report to display data in a table.
 - Select Simple Print to display a report based on the columns that appear in the spreadsheet. This report can then be printed.
 - Select Group Report to display the average, the standard deviation, and the relative standard deviation when multiple samples are selected.
 - Select Ambients to display ambients.
 - Select Hardware Calibration to display the hardware calibration.
 - B. Select the arrow next to Statistics to select how statistics will display.
 - Select None, and statistics will not display.
 - Select Report with Plot, and statistics will display as a line plot.
 - Select Tabular Report, and statistics will display in a table.
 - C. For Heading Text, enter a title for the report, if desired.
 - D. Select the Define Report Fields checkbox, and the Fields tab will display. Use the Fields tab to select the columns from the spreadsheet that will display in the report.
 - E. For Line Printing, select the Automatically Print after Each Analysis checkbox. Enable line printing when printing with a dot matrix printer.
 - F. When Line Printing is enabled, the Automatically Print After Each Analysis checkbox is enabled. When selected, a report will automatically print after each analysis.

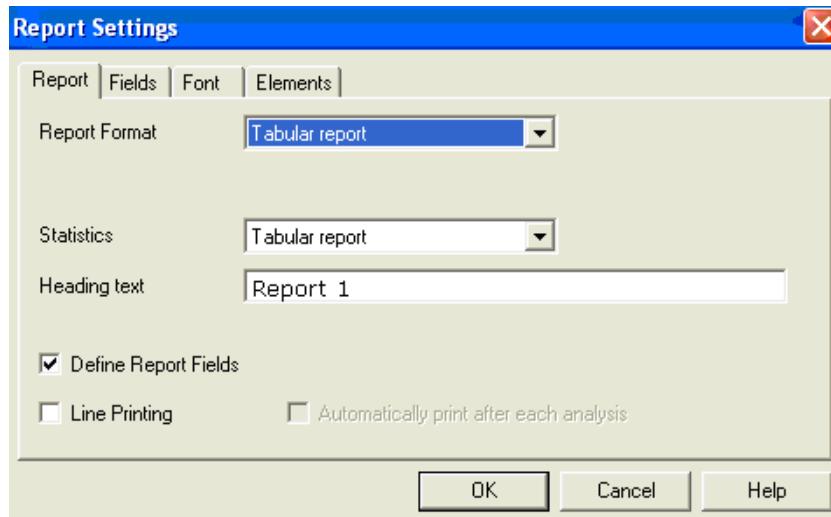
5. Complete the Fields tab as follows to determine the fields that display in the report. The Fields tab will only display when Define Report Fields is checked on the Report tab. Refer to [Configuring Report Before Printing](#), page 5–40. Fields that appear vary, depending on the instrument.



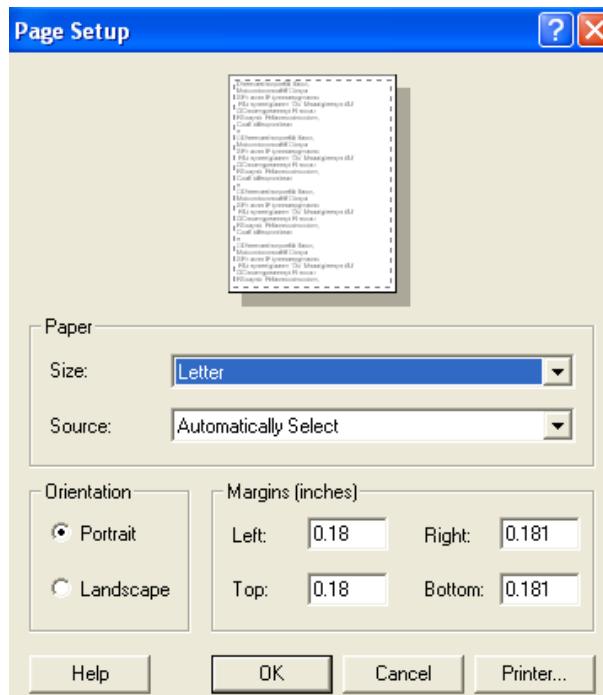
- To display a Field that does not appear in the report, select the field from Invisible Fields, and then select Show. The Field will automatically move to the Visible Fields column.
 - To remove a Field so that it does not display in the report, select the field from Visible Fields, and then select Hide. The Field will automatically move to the Invisible Fields column.
 - To display the default fields, select Default.
 - To move a field so that it displays earlier in the report, select the Field from the Visible Fields column, and select Promote until the field displays in the desired position.
 - To move a field so that it displays later in the report, select the Field from the Visible Fields column, and select Demote until the field appears in the desired position.
6. Use the Font tab to configure the text in the report to improve the readability of the report. Refer to [Configuring Font](#), page 4–23.
7. Use the Elements tab to determine the elements that display in the report.

Printing from the Software

1. From the spreadsheet, select the desired samples that have been analyzed to print. When several samples are selected, the software will group the samples by sample name.
2. Select Samples and select Print. Selecting Print or Print Preview will open the Report Settings dialog box.



3. Refer to [Configuring Report Before Printing](#), page 5–40, to format the report as desired.
4. From the Samples menu, select Print Setup. The Page Setup dialog box will display.



5. Use the Page Setup dialog box to change the size, orientation, and margins of the paper before printing.

NOTE

When multiple columns are selected to appear in the report, the font and page orientation can be adjusted to improve the readability of the report. The font size can be changed using the font tab as described in [Configuring Report Before Printing](#), page 5-40.

6. Select OK. The Print dialog box will appear.
7. Select OK to print.

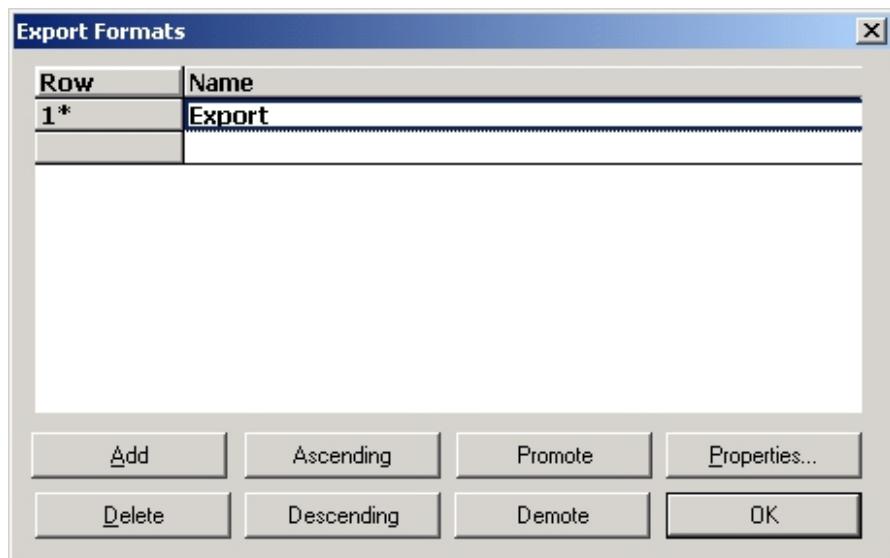
Text Export Data

Before sample data can be exported an export format must be configured.

Multiple export formats can be configured. Export Configuration

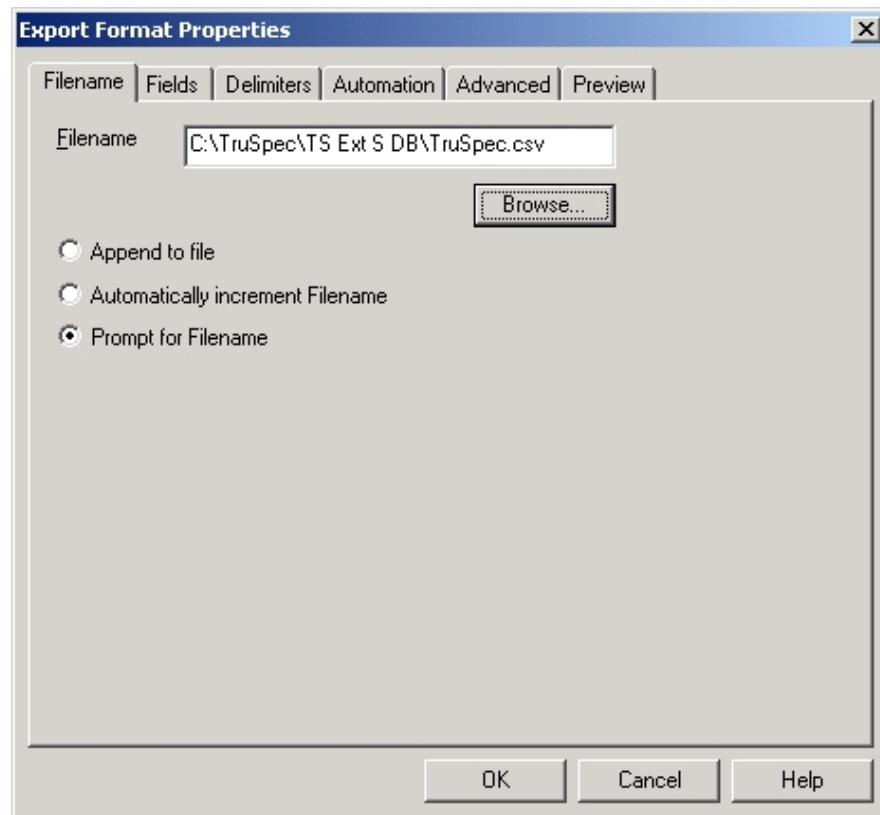
Filename

1. Select the Configuration menu and select Text Export Formats. The Export Format Screen will appear.



2. To move a selected method up toward the top of the list, select it and select Promote.
3. To move the selected method down toward the bottom of the list, select it and select Demote.
4. Select Ascending to list the method in ascending (A to Z) alphabetical order.
5. Select Descending to list the method in descending (Z to A) alphabetical order.

6. Select Properties to configure the text export format. The Filename screen will appear.



7. Enter a file name for the exported file or select browse and search for a file name.
8. Select Append to File, Automatically increment Filename or Prompt for Filename as desired. Refer to [Export Definitions](#), page 5–46.
9. Select OK to save the changes and exit.
10. Select Cancel to exit this procedure without making changes.

Export Definitions

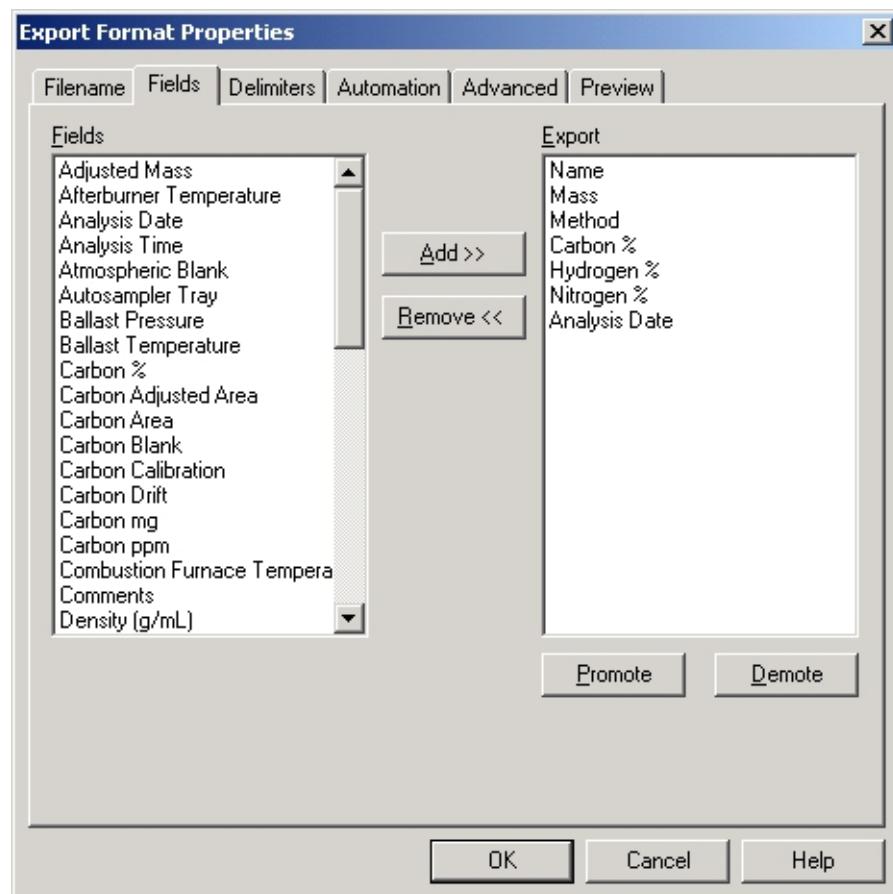
Append to File—When selected, the highlighted sample analysis data will be attached to the previously saved file.

Automatically Increment Filename—If the file name contains numbers, they will automatically be incremented by one when the file is saved.

Prompt for Filename—When selected, the export file name screen will appear when exporting a file, prompting the operator to enter a file name.

Fields

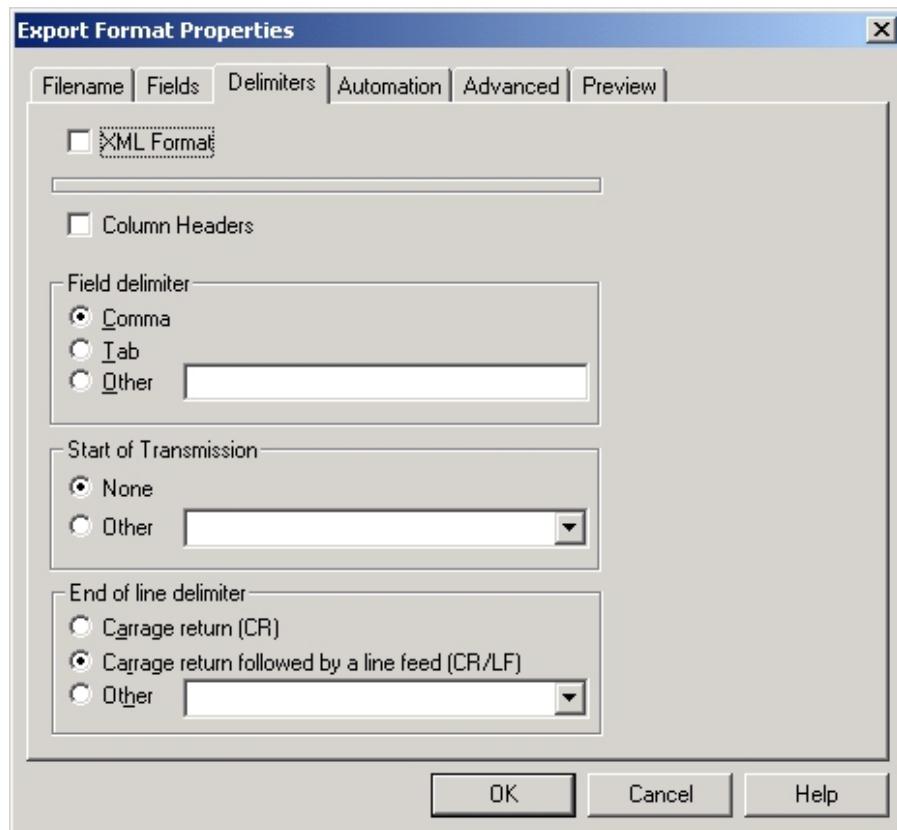
1. Select the Fields tab. The Fields Screen will appear. Select the desired fields to export in the file.



2. To add an invisible field, select the field and select Add.
3. To remove a visible field, select the field and select Remove.
4. To move a selected field up toward the top of the list, select Promote.
5. To move the selected field down toward the bottom of the list, select Demote.
6. Select OK to save the changes and exit.
7. Select Cancel to exit this procedure without making changes.

Delimiters

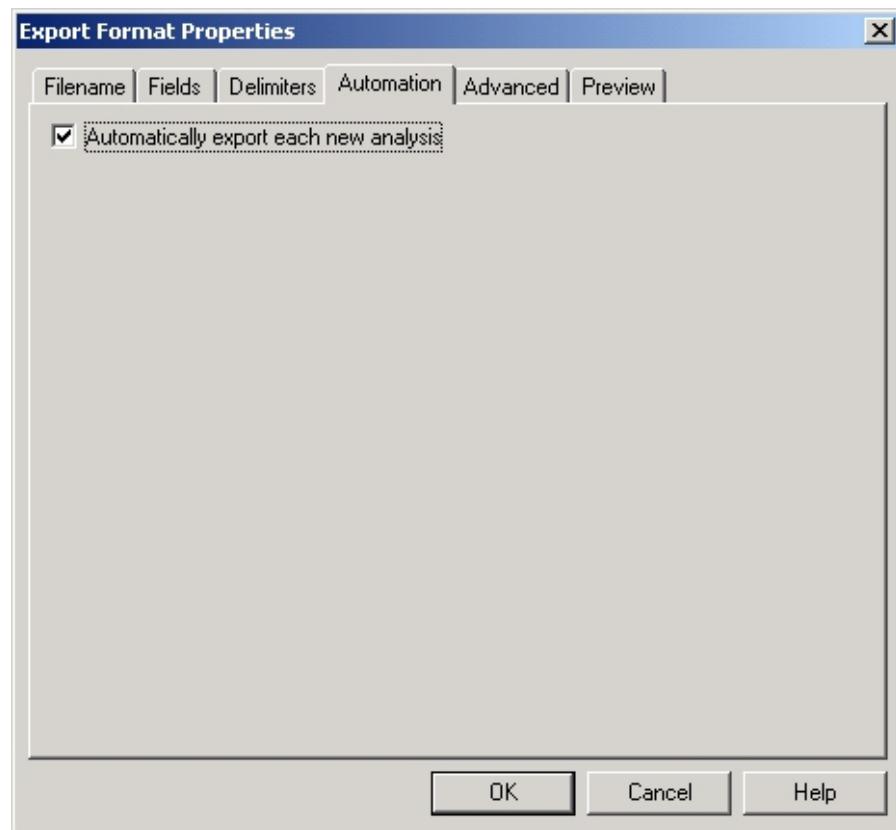
1. Select the Delimiters tab. The Delimiters Screen will appear. Select the desired delimiters to export in the file.



2. Select XML to export the text data in XML format. If XML is selected, no other parameters in the screen can be configured.
3. Select Column Header to transmit the column header.
4. Select or enter the Field, Start of Transmission, and End of Line delimiters.
5. Select OK to save the changes and exit.
6. Select Cancel to exit this procedure without making changes.

Automation

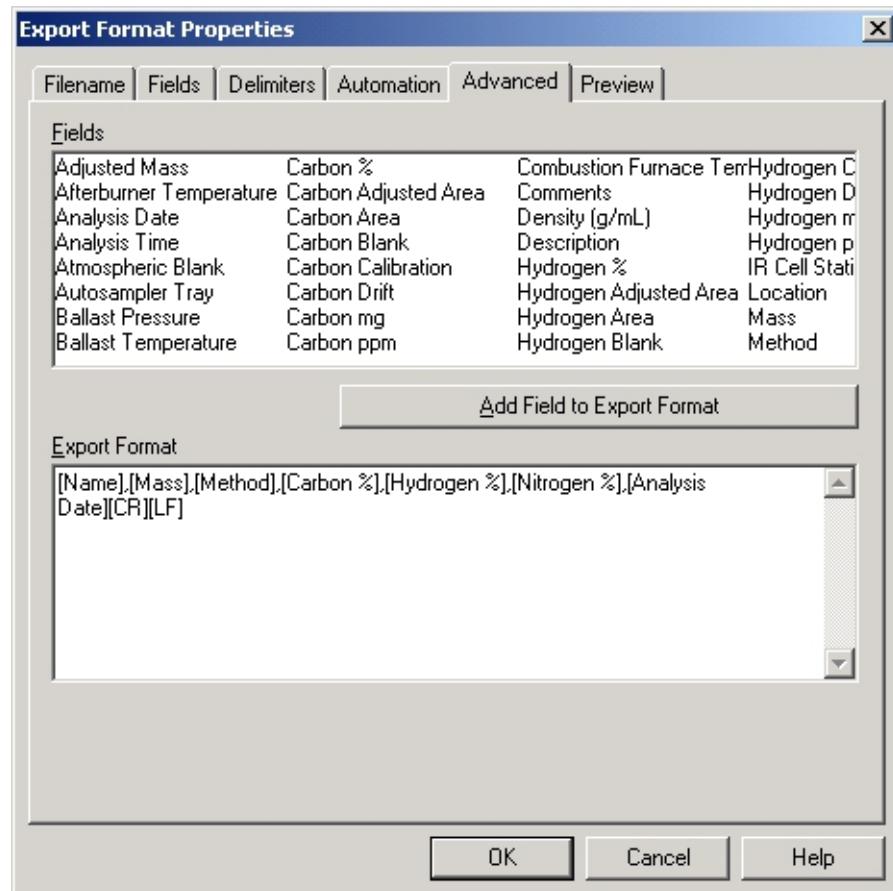
1. Select the Automation tab. The Automation Screen will appear.



2. Select Automatically export each new analysis to automatically export the analysis data after every analysis.
3. Select OK to save the changes and exit.
4. Select Cancel to exit this procedure without making changes.

Advanced

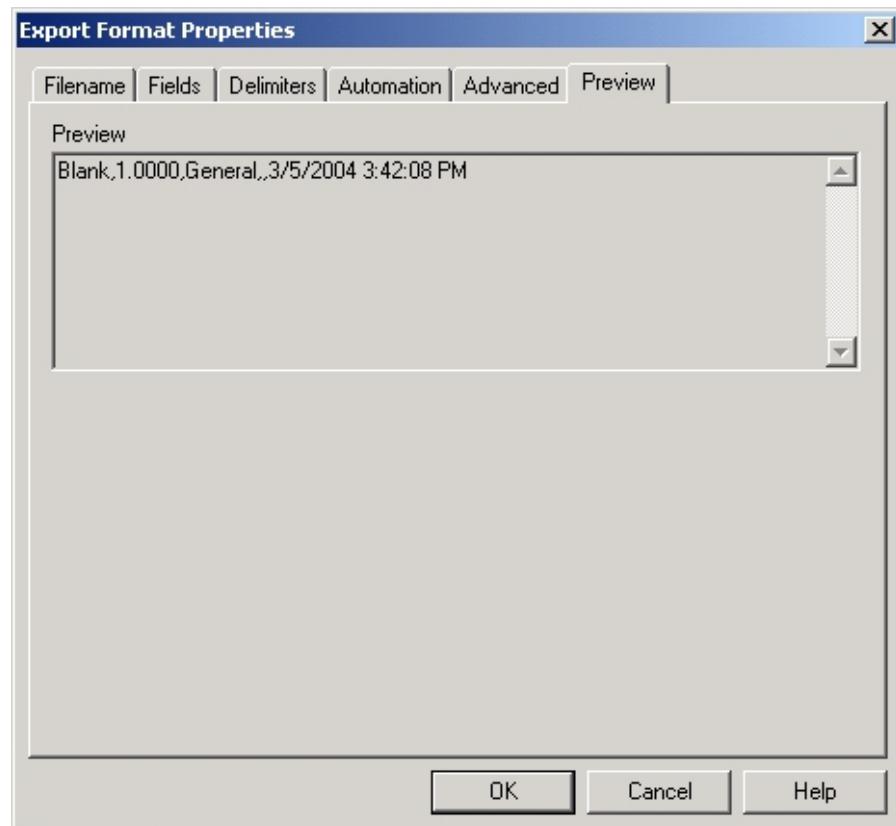
1. Select the Advanced tab. The Advanced Screen will appear.



2. Position the cursor in the Export Format text box and use the mouse to place the cursor at the desired point in the format to add or delete a field.
3. Select a Field from the Fields box and select Add Field to Export Format to add a field.
4. Highlight a Field in the Export Format and then press Delete on the keyboard to delete it.
5. Select OK to save the changes and exit.
6. Select Cancel to exit this procedure without making changes.

Preview

1. Select the Preview tab. The Preview Screen will appear.
- NOTE** → The following screen shot is a status screen to preview the export data format. The export format cannot be changed from this screen. To change the format, refer to [Export Text Data](#), following.



2. Select OK or Cancel to exit.

Export Text Data

Text Export Data permits the operator to select sample data and export that data to a file. Sample data can be inserted into a Microsoft® *Excel* spreadsheet from the exported file.

1. Click and drag the mouse pointer to select the rows with sample data to export to a file.

NOTE → If no sample is selected, only the last sample in the spreadsheet will be exported and saved.

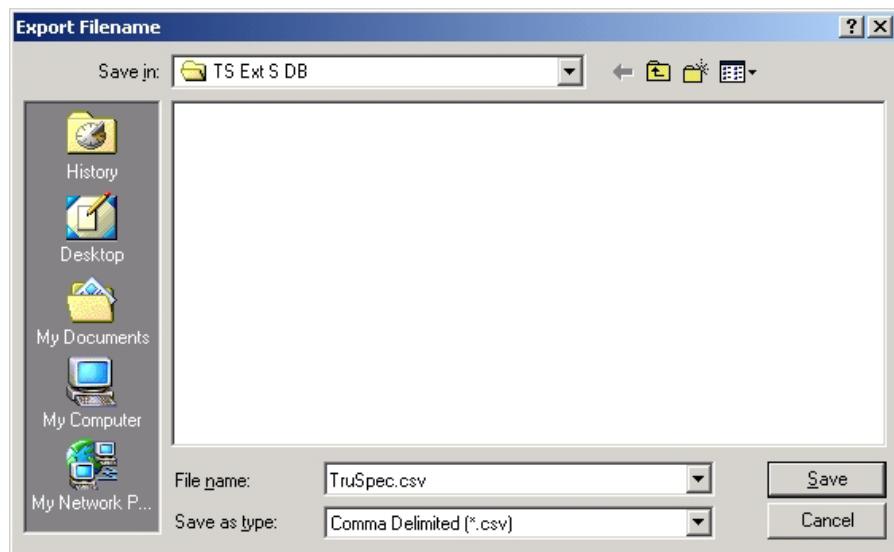
Row	Name	Mass	Method	Analysis Date	Sulfur %
1*	Blank	1.0000	General	3/5/2004 3:37:13 PM	-0.00002
2	Blank	1.0000	General	3/5/2004 3:38:09 PM	-0.00001
3	Blank	1.0000	General	3/5/2004 3:39:03 PM	0.00003
4	Blank	1.0000	General	3/5/2004 3:42:08 PM	0.00000

2. Select the Sample menu and select Text Export Data. The Export Format selection screen will appear.

NOTE → The Select Export format selection screen will not appear unless there is more than one format selected.



3. Select the Export Format and select OK. The Export Filename selection screen will appear.



4. Enter a file name, and select a file type from the Save as Type drop-down box.
5. Select Save to export and save the file.

Export Text Buffers

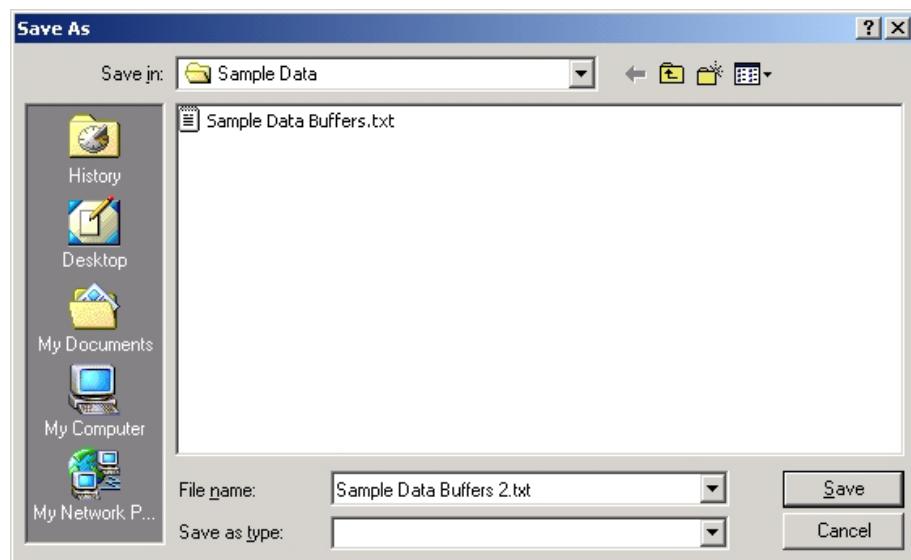
Text Export Buffers permits the operator to select sample plot data and export that data to a file. Sample plot data can be inserted into an *Excel* spreadsheet from the exported file.

1. Click and drag the mouse pointer to select the rows with sample data to export to a file.

NOTE → If no sample is selected only the last sample in the spreadsheet will be exported and saved.

Row	Name	Mass	Method	Analysis Date	Sulfur %
1*	Blank	1.0000	General	3/5/2004 3:37:13 PM	-0.00002
2	Blank	1.0000	General	3/5/2004 3:38:09 PM	-0.00001
3	Blank	1.0000	General	3/5/2004 3:39:03 PM	0.00003
4	Blank	1.0000	General	3/5/2004 3:42:08 PM	0.00000

2. Select the Sample menu and select Text Export Buffers. The Save As screen will appear.



NOTE → File extensions of (.txt) or (.csv) are good choices to insert the saved files into an *Excel* spreadsheet.

3. Enter a file name and extension. Select Save to export and save the file.

Text Import Data

Text Import Data permits the operator to import sample data from an ACSII file. Each line in the file to be imported represents specific information about the sample, with each piece of information being separated by either a tab or comma.

The expected data file formats are shown as follows. The data can be in either of these two formats. Text Import does not support any fields other than these.

- Name,Mass,Description,Comments,Operator (preferred format)
- Mass,Name,Description,Comments,Operator

NOTES → You do not have to fill all fields, but the order is important. For example:

- Sample1,1.01
- Sample2,2.02,Test Sample,Sample from Lab,Kevin

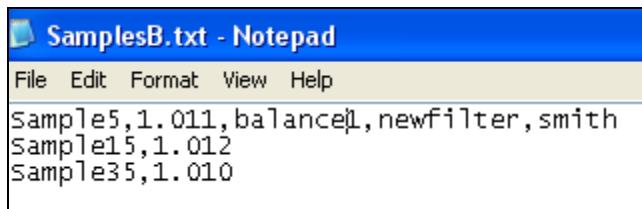
Importing Sample Data

1. Open a text editor, such as Microsoft® Notepad®, or a spreadsheet program, such as *Excel*.

NOTE → A text editor, such as *Notepad*, is recommended. Some spreadsheet software will insert quotation marks at the beginning and end of the data. If quotation marks are inserted behind numerical data such as the mass value, the numerical data may not display in the spreadsheet.

2. Enter sample data into the text editor using the following guidelines.
 - Place the information for each sample on a separate line.
 - The following list shows the fields that can be entered and the order in which they should appear: Sample Name, Mass, Description, Comment, Operator.

An example of the correct format for sample data is shown as follows.

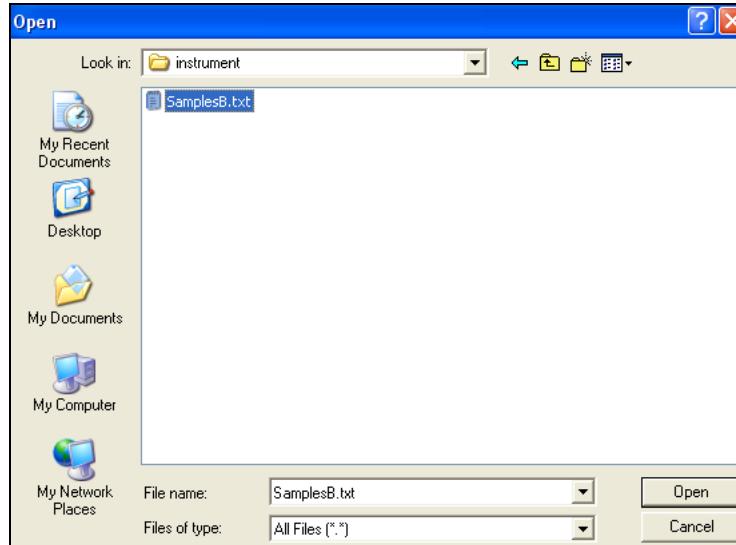


A screenshot of the Microsoft Notepad application window titled "SamplesB.txt - Notepad". The window shows a menu bar with File, Edit, Format, View, and Help. The main text area contains three lines of sample data: "sample5,1.011,balance1,newfilter,smith", "sample15,1.012", and "sample35,1.010".

- If a field is missing from the first line or placed out of order in any line, the information will not display in the correct spreadsheet column.
 - If a field is left blank, the software will fill in the information for that field from the previous sample. For example: if the first sample has Smith listed for Operator and the second sample has a blank Operator field, the software will fill in Smith for the blank field.
 - The fields can be separated by a comma or a tab.
3. Save the file in a .txt or .csv format.
 4. Refer to Importing Sample Data into a Spreadsheet, following.

Importing Sample Data into a Spreadsheet

1. Select Samples on the Menu bar and then select Text Import Data.
2. Select the file to import and select Open.



3. Verify the Sample Name, Mass, Description, Comment, Operator columns display in the spreadsheet. If these columns do not appear, refer to [Configuring Fields](#), page 4–22.

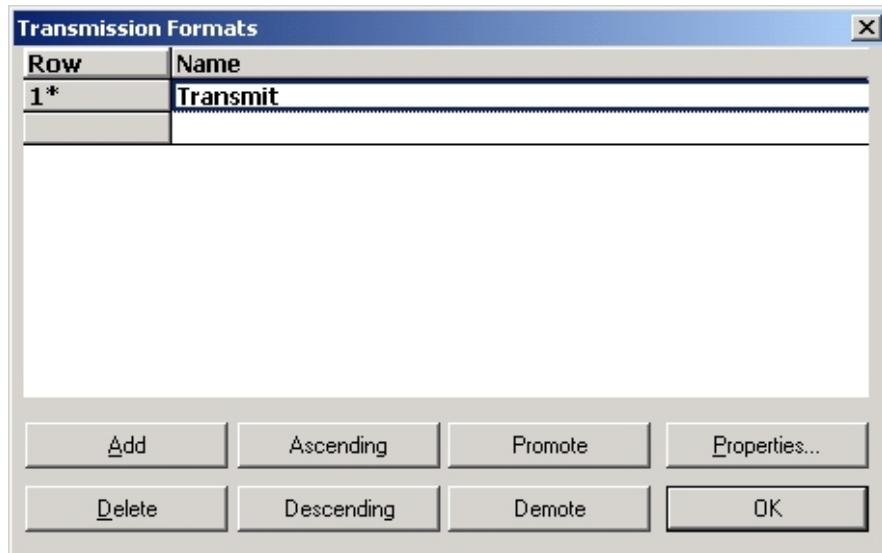
Transmitting Data

Before sample data can be transmitted to a peripheral device, a transmit format must be configured.

Multiple transmit formats can be configured.

Transmit Format Configuration

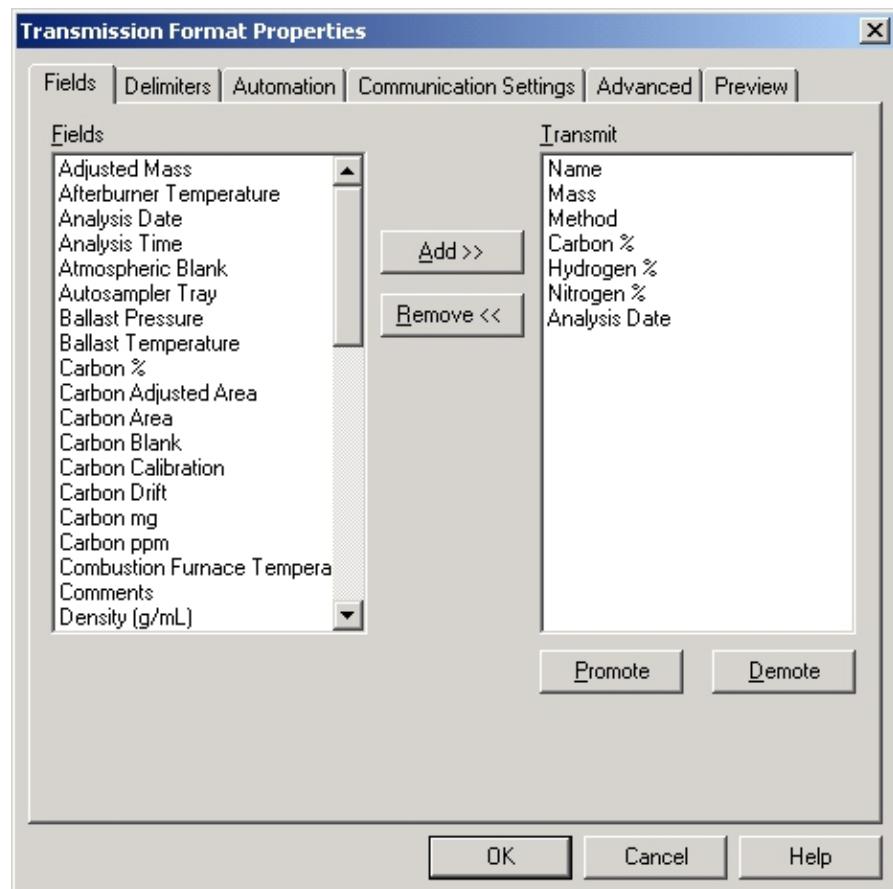
1. Select the Configuration menu and select Transmission Formats. The Transmission Formats screen will appear.



2. To add a new transmission format to the list, select Add and enter a transmission format name in the row that appears at the bottom of the list.
3. To move a selected transmission format up toward the top of the list, select it and select Promote.
4. To move the selected transmission format down toward the bottom of the list, select it and select Demote.
5. Select Ascending to list the transmission formats in ascending (A to Z) alphabetical order.
6. Select Descending to list the transmission formats in descending (Z to A) alphabetical order.
7. To delete a transmission format, select it and select Delete.
8. Select OK to save any changes and exit.

Fields

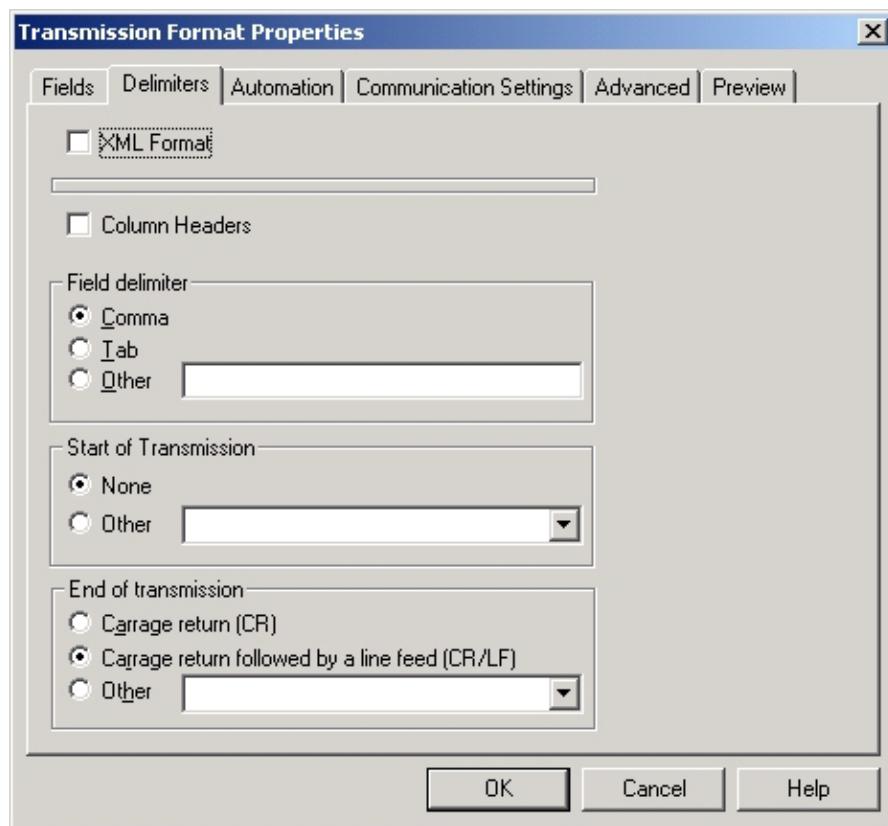
1. Select the transmission format from the transmission format screen and select Properties. The Transmission Format Properties screen will appear with the Fields tab selected.



2. To add a transmit field, select the field and select Add.
3. To remove a transmit field, select the field and select Remove.
4. To move a selected field up toward the top of the list, select Promote.
5. To move the selected field down toward the bottom of the list, select Demote.
6. Select OK to save the changes and exit.
7. Select Cancel to exit this procedure without making changes.

Delimiters

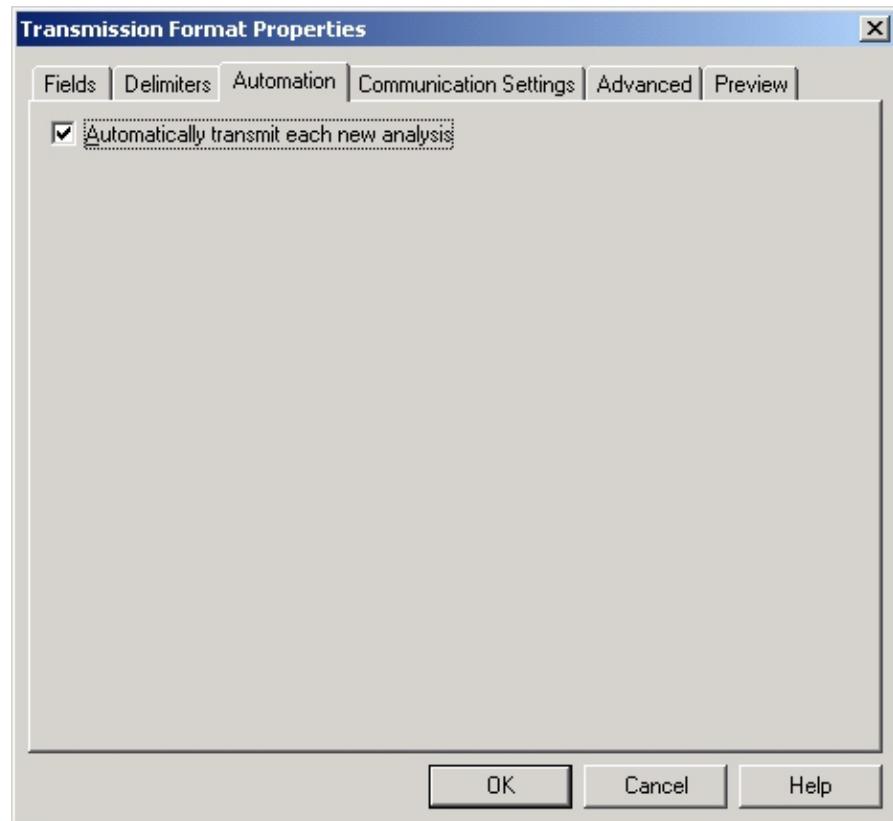
1. Select the Delimiters tab. The Delimiters Format Screen will appear. Select the desired delimiters to export in the file.



2. Select XML to export the text data in XML format. If XML is selected, no other parameters in the screen can be configured.
3. Select Column Header to transmit the column header.
4. Select or enter the Field, Start of Transmission, and End of Line delimiters.
5. Select OK to save the changes and exit.
6. Select Cancel to exit this procedure without making changes.

Automation

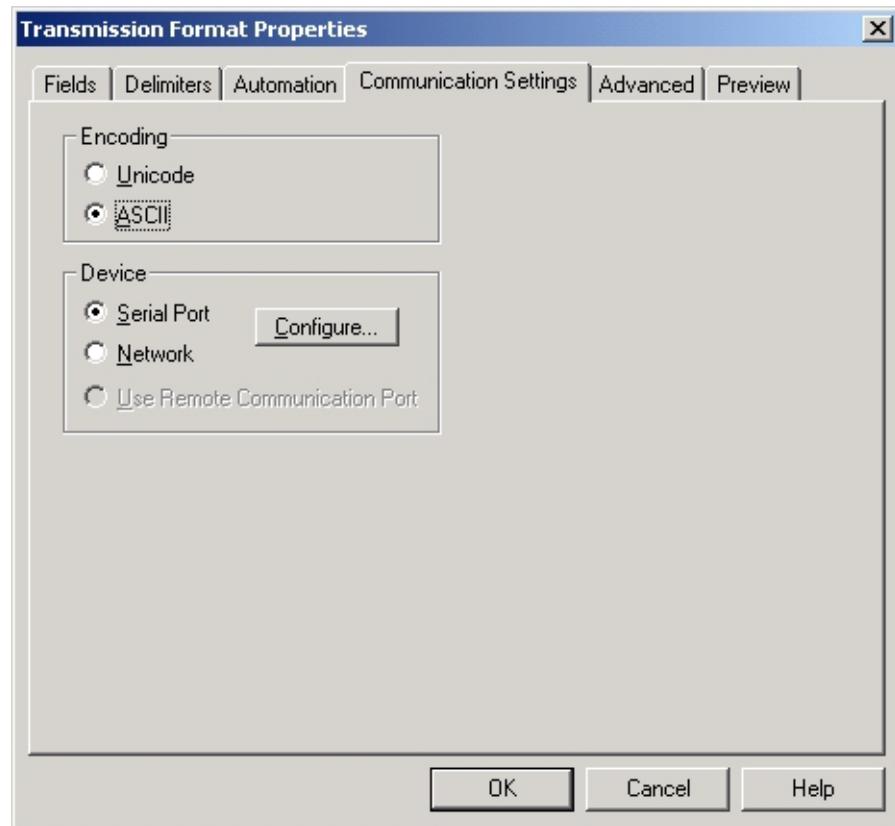
1. Select the Automation tab. The Automation Format Screen will appear.



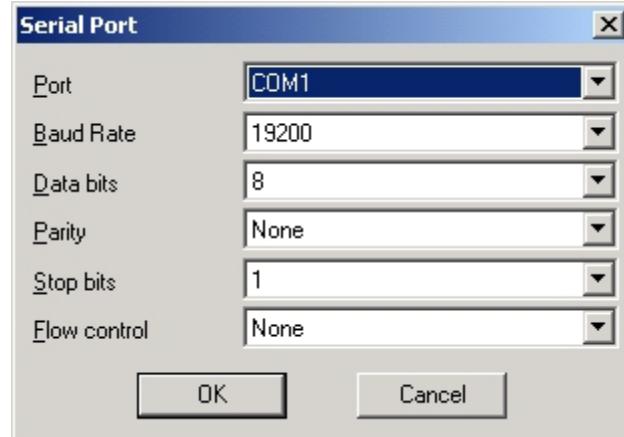
2. Select the Automatically Export Each New Analysis checkbox to automatically export the analysis data after every analysis.
3. Select OK to save the changes and exit.
4. Select Cancel to exit this procedure without making changes.

Communication Settings

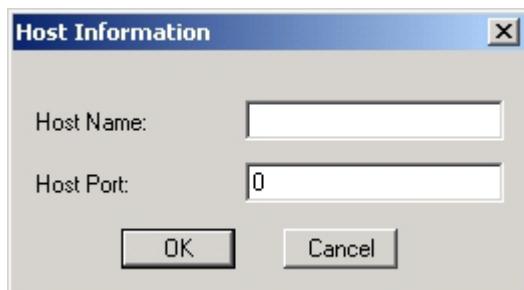
1. Select the Communications Settings tab. The Communications Settings Configuration screen will appear.



2. Select either Unicode or ASCII encoding.
3. Select either Serial Port or Network device.
4. Select Configure to configure serial or network communications.
5. If serial port was selected, the Serial Port Configuration screen will appear. Select the Port, Baud Rate, Data Bits, Parity, Stop Bits, and Flow Control.



6. If network port was selected, the Network Port Configuration screen will appear. Contact your network administrator to configure the network port.



7. Select OK to save the changes and exit.
8. Select Cancel to exit this procedure without making changes.

Serial Port Definitions

Baud Rate—Sets the data transmission speed in bits per second. Selections: 1200, 2400, 4800, or 9600 bps. Default: 9600 bps

Data Bits—Used to select the number of bits per byte for data that will be transmitted. Selections: 5 to 8. Default: 8

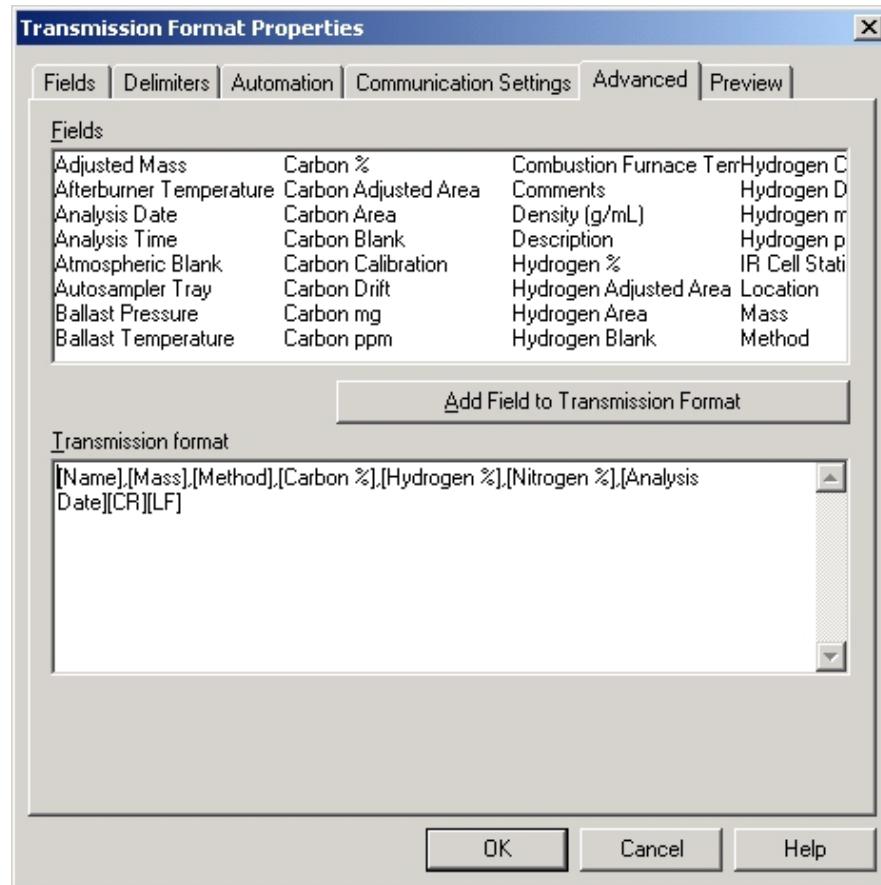
Parity—Sets the method of error checking used. Selections: Even, Odd, or None. Default: Even

Stop Bits—Used to select the number of bits that are used to signal the end of a transmitted data byte. Selections: 1 or 2. Default: 1

Flow Control—Selects the type of data flow control. Selections: Software (xon/xoff), Hardware, or None.

Advanced

1. Select the Advanced tab. The Advanced Transmission Format screen will appear.

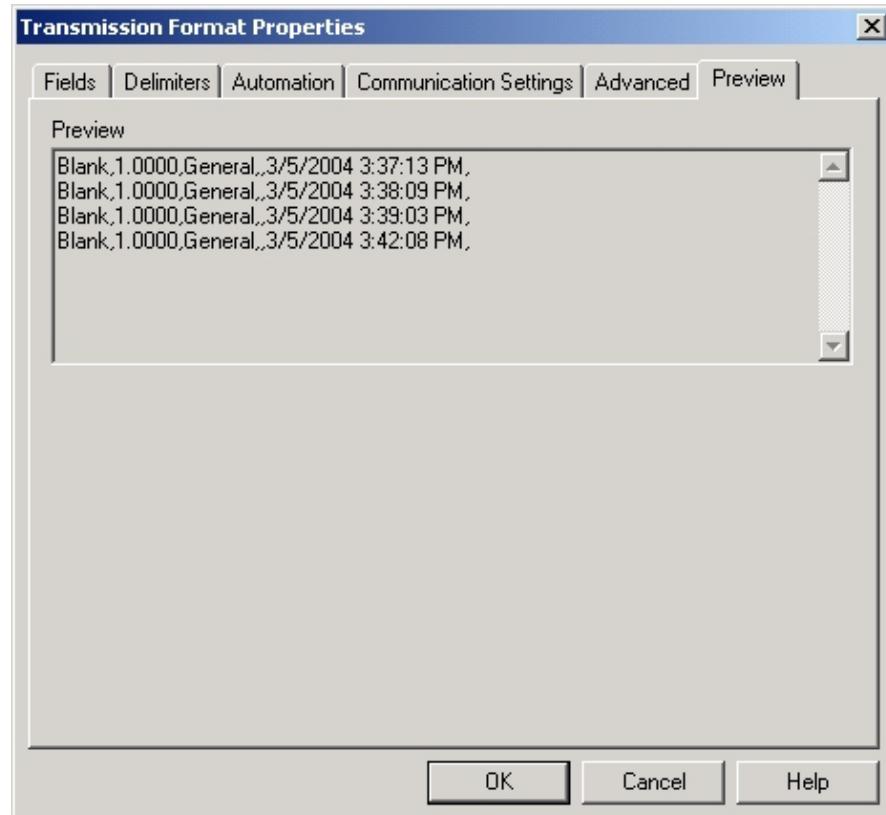


2. Position the cursor in the Transmission Format text box and use the mouse to place the cursor at the desired point in the format to add or delete a field.
3. Select a Field from the Fields box and select Add Field to Export Format to add a field.
4. Highlight a Field in the Export Format and then press Delete on the keyboard to delete it.
5. Select OK to save the changes and exit.
6. Select Cancel to exit this procedure without making changes.

Preview

1. Select the Preview tab. The Preview Transmission Format Screen will appear.

NOTE → This is a status screen to view the transmit data format. The transmission format cannot be changed from this screen.



2. Select OK or Cancel to exit.
3. Select Cancel to exit this procedure without making changes.

Transmit Selected Samples

Transmit Data permits the operator to select sample data and transmit the data to a peripheral device. Sample data can be transmitted from a serial port or over a network.

NOTE → Before data is transmitted, a transmission data format must be defined. Refer to [Transmit Format Configuration](#), page 5–57.

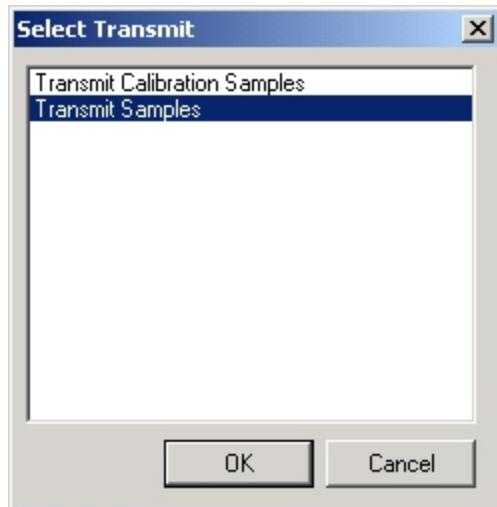
1. Click and drag the mouse pointer to select the rows with sample data to transmit.

NOTE → If no sample is selected, only the last sample in the spreadsheet will be transmitted.

Row	Name	Mass	Method	Analysis Date	Sulfur %
1*	Blank	1.0000	General	3/5/2004 3:37:13 PM	-0.00002
2	Blank	1.0000	General	3/5/2004 3:38:09 PM	-0.00001
3	Blank	1.0000	General	3/5/2004 3:39:03 PM	0.00003
4	Blank	1.0000	General	3/5/2004 3:42:08 PM	0.00000

2. Select the Sample menu and select Transmit. The Transmission Format selection screen will appear.

NOTE → The transmission format selection screen will not appear unless there is more than one format selected.



3. Select the Transmission Format and select OK to transmit the selected sample data. Select Cancel to exit without transmitting any data.

Data Backup

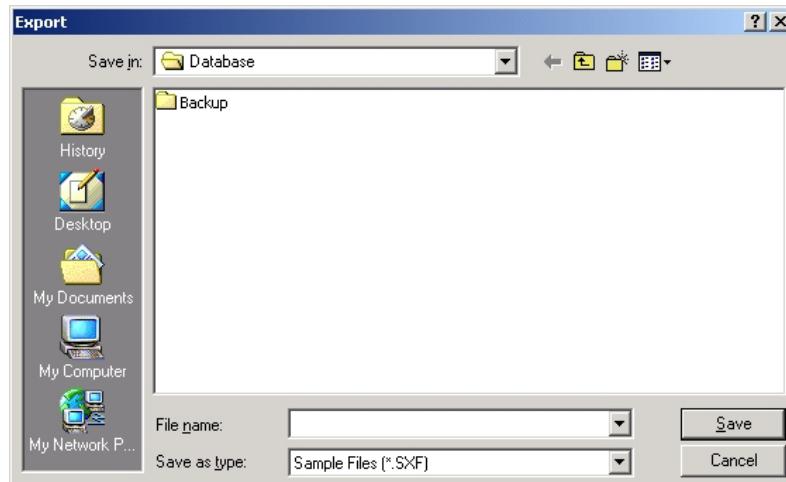
Data Backup permits the operator or manager to export sample data to a file. The file can be saved on the systems hard drive or transferred to another media for safe storage. If necessary, the file can be imported and the sample data restored. Refer to [Transfer Import](#), page 5-67.

Transfer Export

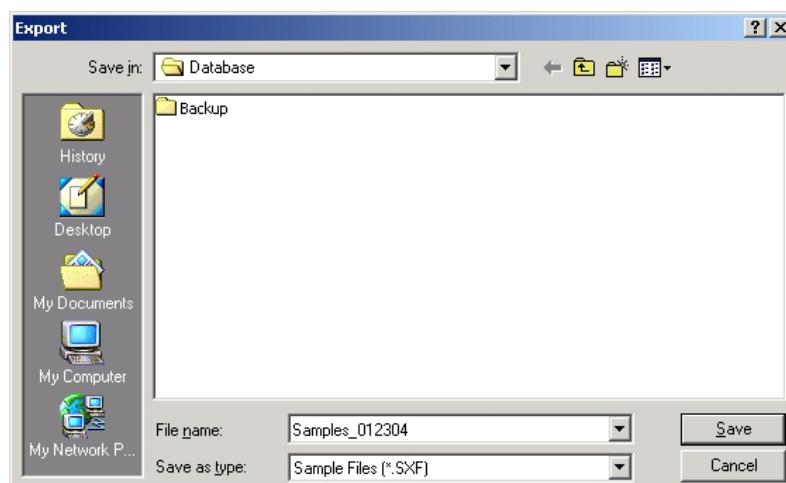
1. Click and drag the mouse pointer to select the rows with sample data to export to a file.

Row	Name	Mass	Method	Analysis Date	Sulfur %
1*	Blank	1.0000	General	3/5/2004 3:37:13 PM	-0.00002
2	Blank	1.0000	General	3/5/2004 3:38:09 PM	-0.00001
3	Blank	1.0000	General	3/5/2004 3:39:03 PM	0.00003
4	Blank	1.0000	General	3/5/2004 3:42:08 PM	0.00000

2. Select the Sample menu and select Transfer Export. The export file selection screen will appear.



3. Select the folder to store the sample data and enter a unique file name without an extension. The software will automatically add the proper file extension.

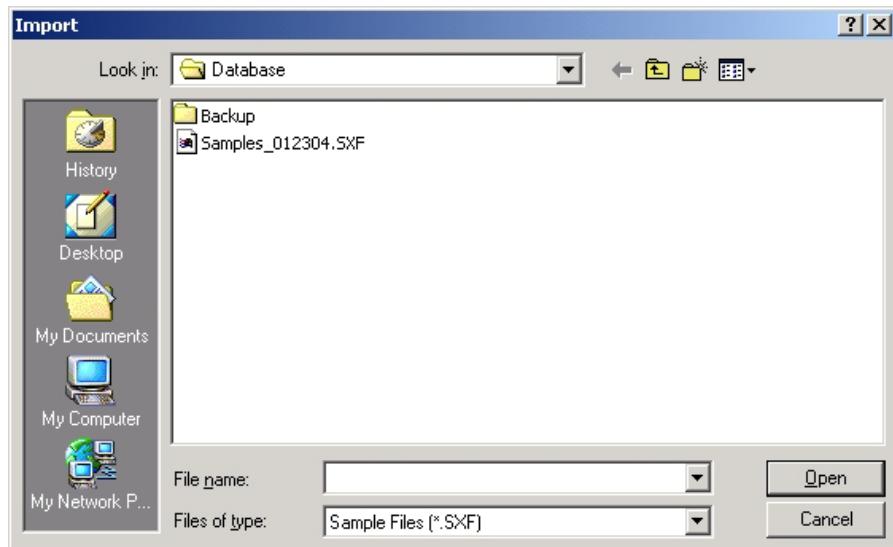


4. Select Save to export and save the sample data to a file.

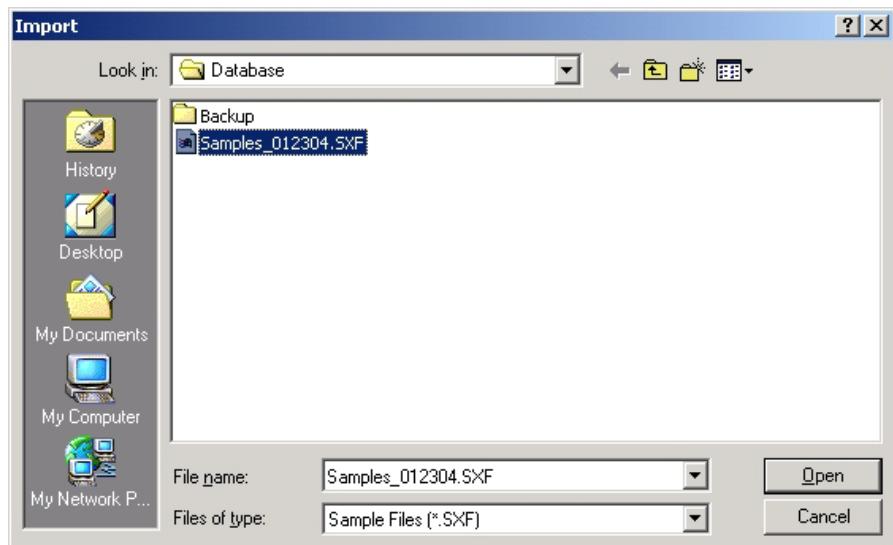
Transfer Import

NOTE → Transfer Import restores sample data that was saved as a file by Transfer Export. Refer to [Transfer Export](#), page 5–66.

1. Select the Sample menu and select Transfer Import. The Import File selection screen will appear.



2. Select the File to import by selecting the file name.



3. Select Open. The sample data stored in the file will be restored as the last samples in the spreadsheet.

Row	Name	Mass	Method	Analysis Date	Sulfur %
1	Blank	1.0000	General	3/5/2004 3:37:13 PM	-0.00002
2	Blank	1.0000	General	3/5/2004 3:38:09 PM	-0.00001
3	Blank	1.0000	General	3/5/2004 3:39:03 PM	0.00003
4	Blank	1.0000	General	3/5/2004 3:42:08 PM	0.00000

Error Messages

Error messages that appear on the screen warn the operator of a condition that could yield an incorrect result or notify the operator of a component failure. Operator problems are most likely to occur after a manual procedure or a change in the setup, method, or system control parameters. When an error message occurs, refer to [Error Message Definitions](#), page 5–68, for corrective action.

NOTE → Please report any errors that are not defined in [Error Message Definitions](#), following, to the LECO Service Department.

Error Message Definitions

Analysis Errors

Message	Cause	Actions
A mass must be entered to analyze a sample.	No mass for sample	Enter a mass for the sample to be analyzed
A method must be defined to analyze a sample.	No method defined for sample	Select a method for the sample to be analyzed
Not Ready - <reason>	Hardware not ready to analyze sample	Fix or wait for indicated reason

Pause

Message	Cause	Actions
The date entered is not a valid date	Invalid data for Pause	Enter a valid date for the pause
First select an unanalyzed sample before selecting this command.	Tried to Pause an analyzed sample	Only use Pause on unanalyzed samples

Analysis Warnings

Message	Cause	Actions
The <element name> answer is outside the\nstandard's defined control limits.\n	Element's results are outside the specified control limits for the defined standard	Check the analysis for anomalies, possibly need to drift the instrument.

Leak Check

Message	Cause	Actions
Failed to pressurize system for leak check.	Could not pressurize the system to check for leaks	Trouble shoot leak check for pressurization leak
Failed Stabilization	Pressure did not stabilize after pressurizing for Leak Check	Trouble shoot leak check for pressurization leak
Leak Check early termination on step <step number>		
Leak (<step number>)	Leak in the indicated step	
Overpressure (<step number>)	Overpressured in indicated step	

Carousel Interaction

Message	Cause	Actions
To use Location, go to system configuration and select the number of carousels being used.	Number of carousels is set to 0	Enter the number of carousels to be used, or do not try to enter a location value
Current location range is <minimum value> - <maximum value>	Entered invalid location value	Enter a location value in the proscribed range

Application Software

Message	Cause	Actions
The application is already running.	Trying to open another instance of <i>TruSpec</i> while the application is running	Only run one instance of the application at a time
You must first exit the application before shutting down.	Session did not end, because you must shut down the application first	Shut down the application and then try to end the session
The selected language module could not be loaded.	Language module missing	Reinstall the software and retry
Missing IR Cell Linearization <file name>	Missing linearization file	Reinstall the software and retry

Software Registration

Message	Cause	Actions
The registration information could not be saved.	Unable to save the registration number for <i>TruSpec</i> , most likely to Permission restrictions on the user	Log on as Administrator and try entering the registration number again
Invalid software registration.	Incorrect software registration number for the instrument and the entered configuration	Verify that the instrument is powered, the information in the registration box is correct. Contact LECO for a correct registration number
Equipment number does not match.	Improper register code has been entered	Contact LECO

Blank Calibration

Message	Cause	Actions
First select the blanks to use for setting the new method blank area before selecting this command.	No samples selected	Select the samples to be used
The selected blanks must all have a method before setting the new method blank area.	No method in one or more of the selected samples	Select a method for each sample to be used
The selected blanks must all have been analyzed before setting the new method blank area.	One or more of the selected samples have not been analyzed	Analyze all of the samples to be used
The selected samples must all be blanks before setting the new method blank area.	Selection include some sample other than blanks	Select only blanks and try again
The selected blanks must all refer to the same method before setting the new method blank area.	Selected samples refer to multiple methods	Select only samples with the same method

Standard Calibration

Message	Cause	Actions
WARNING: The sample blank on one or more samples does not match the current method blank.\n Do you wish to recalculate the selected results for the current method blank?	Not all calibration samples are using the same blank	Decide whether to continue with calibration with using different or the same blank value
Warning: This action will change all cells to use single standard calibration. Do you still want to make the change?	Select an element to use Single Standard Calibration	Decide whether to select Single Standard Calibration for all elements
Warning: This action will change all other cells from single standard calibration to linear calibration. Do you still want to make the change?	Selected an element to switch from Single Standard Calibration to a regular curve order	Decide whether to stay in Single Standard Calibration for all elements or switch out of that mode
The selected standards must all have a mass before creating a calibration.	No mass for one or more selected samples	Enter a mass for all samples
The selected standards must all have a method before creating a calibration.	No method in one or more of the selected samples	Select a method for each sample to be used
The selected standards must all have been analyzed before creating a calibration.	One or more of the selected samples have not been analyzed	Analyze all of the samples to be used
The selected standards must all refer to the same method before creating a calibration.	Selected samples refer to multiple methods	Select only samples with the same method
First select the standards to use for calibration before selecting this command.	No samples selected	Select the samples to be used
The selected samples must all be standards before creating a calibration.	Samples selected are not standards	Select only standards
Drift Failed	Error in UI grid creation or database access	Exit, restart and retry
No drifts to show.	No drift history	Action only accessible when there is a drift history
There are no drift standards defined.	No drift standards defined for the method	Pick drift standards for the method from the calibration window
Warning: This sample is used in calibration. This change will invalidate the current calibration and/or drift. Do you still want to make the change?	Changing a sample used for calibrating a method	Decide whether to accept the sample change and its effect on calibration

Maintenance Counters

Message	Cause	Actions
This counter is required and cannot be deleted.	Tried to delete a required counter	Do not try to delete required counters
A counter with name <name> already exists	Trying to create a new counter	Use a different name

Balance

Message	Cause	Actions
The balance is sending more frequently than allowed.\n either the balance is configured incorrectly,\nor the print key on the balance was pressed twice.	Multiple mass entries from the balance in rapid succession	Check balance communication setting at the balance and the PC

Users

Message	Cause	Actions
You do not have permission to\n<name of action trying to be performed>	User is restricted from the action	Change user permission or sign on as a user with the proper permission
Access is Read Only	User is restricted from the action	Change user permission or sign on as a user with the proper permission
Failed to get the user name from operating system.\n Starting application in guest mode.	Operating system did not report a user name	Restart system and retry, contact LECO
User <user name> does not exist in the application.\n Contact administrator to add the user.\n Starting application in guest mode.	User name does not exist	Have the user added to the system or sign on with a valid user
You cannot remove the rights to "<user name>" for the currently logged on user.	Tried to remove the rights for the currently logged on user	Alter the permissions from the administrator user

Standards

Message	Cause	Actions
You cannot name a standard "blank"	Tried to name a standard 'Blank'	Do not name standards 'Blank'. It is reserved for application use
You cannot delete standard "<standard name>".\nIt is referenced by a sample.	Tried to delete a standard still in use	Delete all references to the standard before deleting the standard
A standard with name <name> already exists	Trying to create a new standard	Use a different name

Sample

Message	Cause	Actions
You cannot delete sample "<sample name>".\n It is referenced by a calibration.	Tried to delete a sample used by calibration	Remove sample from calibration if it needs to be deleted
First select the samples to recalculate before selecting this command.	No samples selected	Select the samples to be used
One or More Cell(s) are Not Editable	Entering data into field that is not editable	Do not enter data into uneditable fields
There are no samples to delete.	No sample in the sample log	
The sample that is currently being analyzed was not deleted.	Cannot delete a sample while it is being analyzed	Either stop the analysis and then delete the sample or wait for the analysis to complete
First select the samples to delete before selecting this command.	No samples selected	Select the samples to be used

Sample Template

Message	Cause	Actions
A sample template with name <name> already exists	Trying to create a new sample template	Use a different name

Method

Message	Cause	Actions
Methods have been lost for the following sample rows: \n<row numbers>\n\nThe method <method name> with default settings has been created\nand inserted into each of the above sample rows.	Method missing	Software created default method, samples and method must be reviewed for integrity.
You will need to recalibrate method(s):\n<method names>	Calibrations were missing from the names methods	Calibrate each of the methods
You cannot delete method "<method name>".\n It is referenced by a sample.	Trying to delete a method which is still in use	Delete all samples and other information referenced by the method before deleting the method
The method <method name> does not exist.	Tried to enter the name of a non-existent method	Select an existing method or create a method with that name
A method with name <name> already exists	Trying to create a new method	Use a different name

Export

Message	Cause	Actions
Could not open the file\n<file name> for exporting.\n	This error can occur when trying to export a file	Verify that the file was not deleted or moved.; Verify that the file is not a read only file or it is currently open.; Retry exporting with a different name; If error persists, contact LECO
First select the samples to be exported before selecting this command.	No samples selected	Select the samples to be used
An error occurred exporting the method(s).	Database or file error	Retry with different export target
An error occurred importing the method(s).	Database or file error	Retry with different import target
An error occurred exporting the sample(s).	Database or file error	Retry with different export target
An error occurred importing the sample(s).	Database or file error	Retry with different import target

Quality Control

Message	Cause	Actions
Checks failed and no drift is scheduled.	Check standard failed and no drift action	Drift the instrument
Checks failed beyond the retry count.	Checks have failed too many times	Examine check standards

Drift Calibration

Message	Cause	Actions
Drift Mass Range Error : Nominal Mass (<nominal mass>); Range (<acceptable mass range>); Value Entered (<entered mass value>)	Entered a mass value outside the acceptable range for the drift standard	Only enter mass ranges appropriate to the drift standard

Transmit

Message	Cause	Actions
There are no samples to transmit.	No sample in the sample log	
First select the samples to transmit before selecting this command.	No samples selected	Select the samples to be used
A transmission format must be defined to transmit a sample.	A data transmit format has not been set up for this method	Create a data transmit format for the method. See setup transmission formats
A communications error occurred while transmitting.	An undefined error occurred during data transmit	Verify the port exists, is active, and is not in use by other applications; If error persists contact LECO

Instrument Connection

Message	Cause	Actions
Equipment access failed\n<reason>\nInstrument control will be disabled\nTrying stand alone registration		
...SR0: Cannot access USB DLL	There have been installation problems, the connections have been severed, or there is no power.	Ensure proper power cable connections; Check all cable connections; reinstall the software
...SR1: Cannot access USB driver	The computer has an old copy of a necessary dll file	A user with full permission must reinstall the software
...SR2: A newer version of the USB driver is required	The computer has an old copy of a necessary dll file	Install the latest software
...SR3: Cannot open USB device	Driver not running or installed properly, no connection, no power	Ensure proper power cable connections; Check all cable connections; reinstall the software
...SR4: Cannot obtain USB device information	Either the connections have been severed or there is no power	Ensure power is reaching the instrument; Check and fit all instrument connections
...SR5: Cannot find a USB device	Cannot obtain USB device information	Install the latest software

External Sulfur Application Start

Message	Cause
The <i>TruSpec</i> External Sulfur option is not registered. The software is closing. Sulfur was not listed as a registered option.	Contact LECO for registration with Sulfur

6 Maintenance

The Maintenance chapter includes procedures that should be performed on a regular basis to improve the instrument's performance and lifespan. The procedures included in this chapter may require disabling power to the instrument and should be performed only by trained personnel.

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Periodic Maintenance Schedule

The following schedule is a list of maintenance procedures that should be performed on a regular basis. For more information concerning periodic maintenance and periodic maintenance procedures, refer to the individual topics.



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In order to obtain the best possible analysis results, periodic maintenance must be performed at the intervals listed as follows.



The following maintenance intervals should be entered into maintenance counters to notify the operator when maintenance should be performed. Refer to [Configuring Maintenance Counters](#), page 6-36.

Maintenance Item	Location of Maintenance Item	Inspection, Cleaning, and Maintenance Intervals
Air Filter Cleaning	On the top of the instrument cabinet.	Vacuum daily and wash monthly to prevent clogging. Refer to Cleaning the Filter , page 6-7.
Anhydrene® Tube	Accessed through door on right side of determinator.	Check daily and repack when Anhydrene cakes, about 100 analyses. Refer to Packing the Anhydrene Tube , page 6-8.
Carousel Cleaning	On top of the loading head assembly.	The carousel should be cleaned weekly. Refer to Cleaning the Carousel , page 6-10.
Combustion Tube Packing	Inside furnace assembly. WARNING: Disconnect facility power and let furnace cool before removing combustion tube.	Replace the copper sticks in the secondary side every 250 - 350 analyses. Replace the copper oxide in the primary side every 1000 to 1500 analyses. Refer to Packing the Combustion Tube , page 6-12.
Crucible Replacement	Inside combustion tube. Remove loading head and use tongs to remove crucible. WARNING: Furnace may be hot.	Replace every 200 analyses. Replace the Reticulated Micro Crucible, used in the CHNS micro only, every 75 analyses. Refer to Replacing the Crucible , page 6-17.

Maintenance Item	Location of Maintenance Item	Inspection, Cleaning, and Maintenance Intervals
Loading Head Cleaning	On top of the furnace shelf above the furnace assembly.	Inspect every day and clean ashes and soot if necessary. Refer to Cleaning the Loading Head , page 6–19.
Incoming Helium Scrubber, Repacking the Reagent Tube	Behind the access door on the front panel of instrument.	Replace every 90 days or when <i>Anhydrene</i> cakes or LECOSORB® changes colors. Refer to Packing the Reagent Tube , page 6–23.
O-rings	Located in various assemblies, reagent tubes, and loading head.	Replace when repacking or replacing the reagent tubes, cleaning an assembly, or when damaged. Refer to O-rings , page 6–25.
Reduction Heater Tube Packing	Inside catalyst heater assembly. WARNING: Disconnect facility power and let catalyst heater cool before removing reduction heater tube.	Replace approximately 1500 analyses. Refer to Packing the Reduction Heater Tube , page 6–26.
Screen Filter Cleaning	Inside reagent tubes at the bottom.	Clean when reagent tubes are packed. Refer to Cleaning the Screen Filter , page 6–29.

Cleaning the Filter

NOTE → The air filter should be vacuumed daily and washed monthly to prevent clogging.

1. Locate the air filter on the top of the instrument.
2. Remove the air filter by sliding it out toward the left side of the instrument.
3. Inspect the air filter for damage. If it is damaged, replace it.
4. Wash the air filter with a mild solution of detergent and water. Let it air dry.



CAUTION

To prevent damage to the instrument, make sure the air filter is completely dry before reinstalling it on the instrument.

5. Lightly spray the air filter with air filter coating.
6. Reinstall the air filter back into the instrument.

Packing the Anhydrene Tube



Anhydrene is a strong dehydrating agent and potentially strong oxidant over 150°C. Do not heat with organic matter, flammables, or combustibles. Avoid contact with strong acids. Refer to Safety Data Sheet (SDS) for procedures.

Removal

1. Open the small door on the right side of the determinator and remove the glass *Anhydrene* tube.
2. Slide reagent tube upward until the bottom end can swing free.
3. Tilt out the free reagent tube end.
4. Pull the reagent tube downward off the top port.

Packing

1. Insert a ½ inch wad of quartz wool into one end of the tube. Refer to Figure 6-1, page 6-9.
2. Fill the tube with 2 ¾ inches of *Anhydrene*.
3. Insert a ½ inch wad of quartz wool on top of the *Anhydrene*.

Installation



After installation, make sure none of the quartz wool strands interfere with the o-ring seal.

1. Push the top end of the reagent tube over the top port.
2. Tilt the reagent tube inward and pull it down, pushing it over the bottom port.
3. Close the door on the side of the determinator.

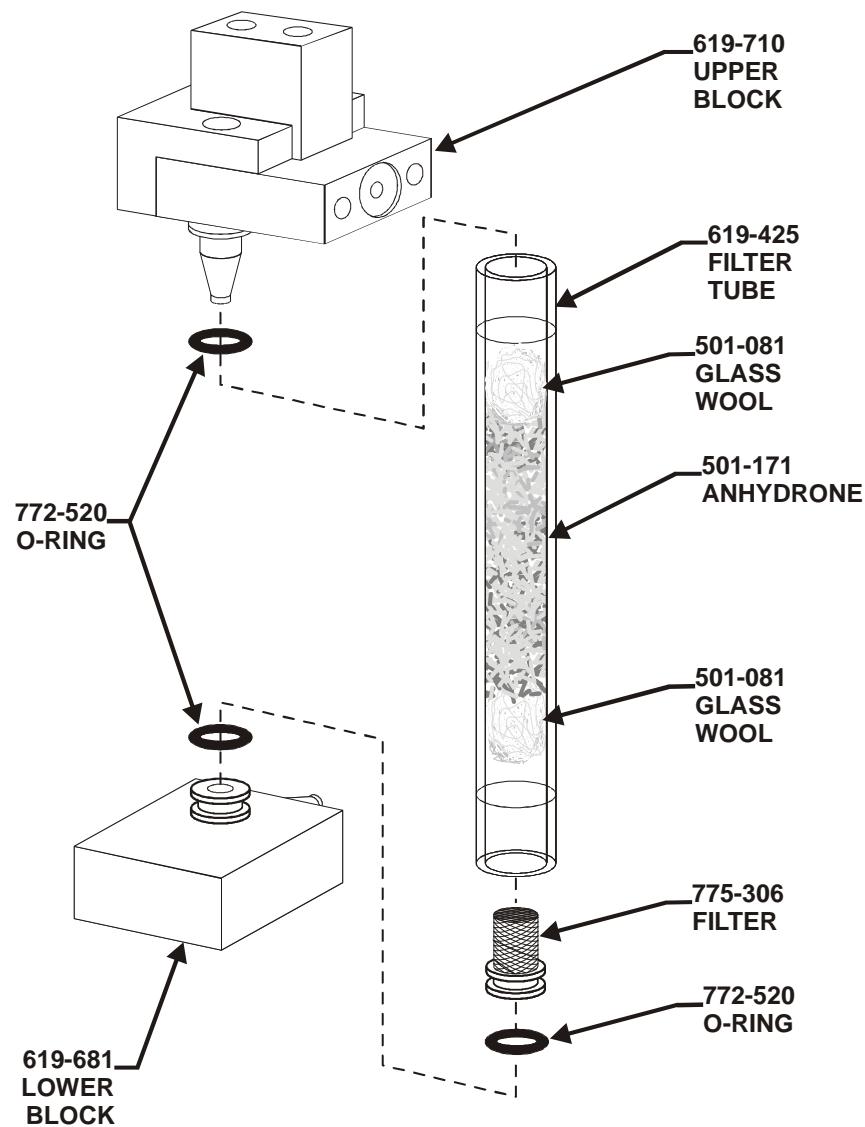


Figure 6-1
Anhydroner Tube Packing

Cleaning the Carousel

NOTE → The carousel should be cleaned weekly to remove dirt and permit it to turn freely.

1. Remove the carousel from the instrument by pulling it up and off the loading head. Refer to [Figure 4-1](#), page [4-7](#).
2. Remove the four screws securing the bottom plate to the carousel body.
3. Wipe the carousel and bottom plate with a damp cloth.
4. Apply a thin coat of grease to the carousel bearings. Refer to [Figure 6-3](#), page [6-11](#).
5. Reinstall the metal plate.

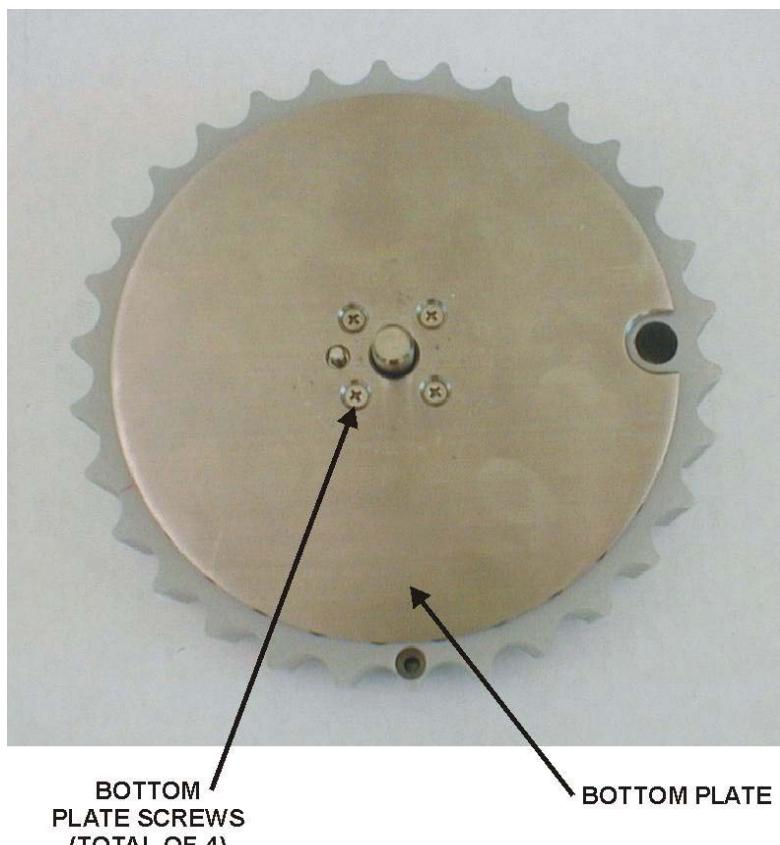
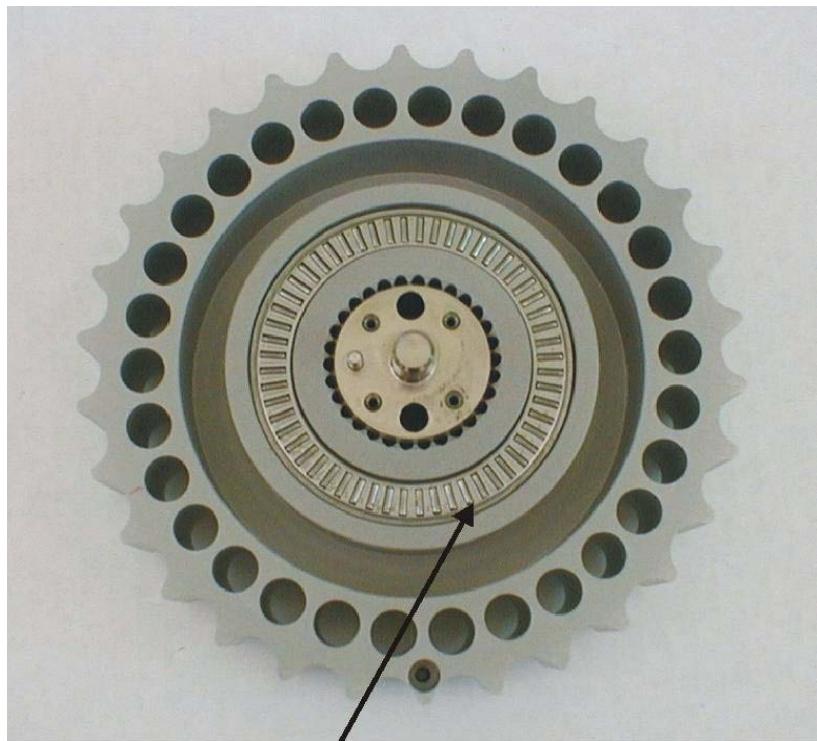


Figure 6-2
Carousel Bottom View



CAROUSEL BEARINGS

Figure 6-3
Carousel Bearings

Packing the Combustion Tube

NOTE

If it becomes necessary to remove the combustion tube, refer to [Removing and Replacing the Combustion Tube](#), page 6–30.

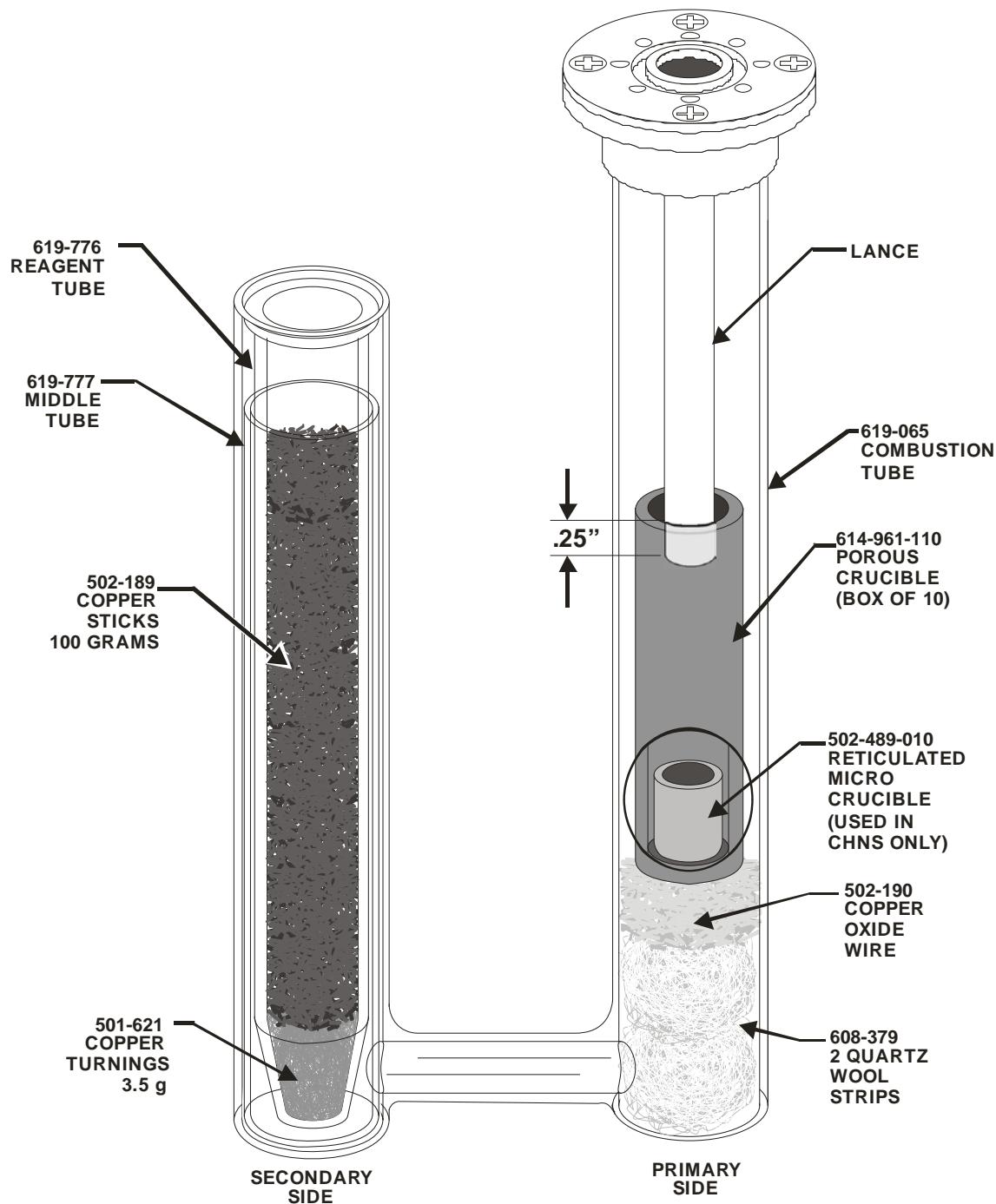


CAUTION

POSSIBLE COMBUSTION TUBE DAMAGE

Do not touch the lower portion of the combustion tube without gloves. Body oil can promote devitrification that may cause the combustion tube to crack.

1. Remove 1 quartz wool strip from the package. Separate it lengthwise into 2 sections, being careful to match the outside diameter of the roll to the inside diameter of the combustion tube. Each section is $\frac{3}{4}$ -inch wide.
2. Using the crucible extractor, push two rolled quartz wool strips into the primary side of the combustion tube until the rolls are properly positioned in the combustion tube. Refer to [Figure 6-4](#), page 6–13.
3. Pour $\frac{3}{4}$ inch of copper oxide wire into the primary side of the combustion tube until it rests on the quartz wool strips.
4. Insert the combustion tube into the furnace, and seal it with two high-temperature orange o-rings.
5. In the primary side of the combustion tube, insert the crucible until it rests on the copper oxide wire. If you're packing the combustion tube for the CHNS micro, insert the reticulated micro crucible inside the larger crucible.
6. Insert the lance assembly into the primary side of the combustion tube. The bottom of the lance tube should be positioned at least $\frac{1}{4}$ inch inside the crucible. Refer to [Figure 6-6](#), page 6–16.
7. Add or remove a small amount of copper oxide wire under the crucible to ensure that the bottom of the lance is properly positioned inside the crucible.
8. Push 3.5 grams of copper turnings into the top of the secondary reagent tube. Compress the copper turnings until they fill 0.75 inches of the bottom of the tube.
9. Pour copper sticks on top of the copper turnings.
10. Insert the secondary reagent tube into the secondary side of the combustion tube.
11. Seal the secondary side of the combustion tube with the afterburner interface block.



ALTERNATE PACKING: The copper oxide wire can be replaced with 502-644 Furnace Reagent in the primary side of the combustion tube. This furnace reagent is removable with the optional vacuum cleaner; however, the furnace reagent should be baked prior to using.

Figure 6-4
Combustion Tube Packing (Micro)

Alternate Combustion Tube Packing

This combustion tube packing procedure may be used as an alternative to the previous packing procedure described in [Packing the Combustion Tube](#), page 6-12. It permits easier removal of the spent reagents; the combustion tube does not have to be removed to remove the copper oxide. Depending on your application, it may have a slight negative effect on hydrogen results.

NOTES ➔

- Only replace the combustion tube if it becomes cracked or plugged. The combustion tube can be reused even if it looks cloudy.
- If it becomes necessary to remove the combustion tube, refer to [Removing and Replacing the Combustion Tube](#), page 6-30.



CAUTION ➔

POSSIBLE COMBUSTION TUBE DAMAGE

Do not touch the lower portion of the combustion tube without gloves. Body oil can promote devitrification that may cause the combustion tube to crack.

1. Remove 1 quartz wool strip from the package. Separate it lengthwise into 2 sections being careful to match the outside diameter of the roll to the inside diameter of the combustion tube. Each section is $\frac{3}{4}$ -inch wide. Only one section will be used.
2. Using the crucible extractor, push one rolled quartz wool strips into the primary side of the combustion tube until the roll is properly positioned in the combustion tube. Refer to [Figure 6-5](#), page 6-15.
3. Insert the combustion tube into the furnace, and seal it with two high-temperature orange o-rings.
4. Pour 18 grams of Copper Oxide Wire into the 625-511-154 porous insert.
5. In the primary side of the combustion tube, insert the 625-511-154 porous insert, with copper oxide wire, until it rests on the copper quartz wool strip.
6. Insert the 614-961-110 porous crucible into the primary side of the combustion tube until it rests on the copper oxide wire. If you are packing the combustion tube for the CHNS micro, insert the reticulated micro crucible inside the larger crucible.
7. Insert the lance assembly into the primary side of the combustion tube. The bottom of the lance tube should be positioned at least $\frac{1}{4}$ inch inside the crucible. Refer to [Figure 6-6](#), page 6-16.
8. Push 3.5 grams of copper turnings into the top of the secondary reagent tube. Compress the copper turnings until they fill 0.75 inches of the bottom of the tube.
9. Pour 100 grams of copper sticks on top of the copper turnings.
10. Insert the secondary reagent tube into the secondary side of the combustion tube.
11. Seal the secondary side of the combustion tube with the afterburner interface block.

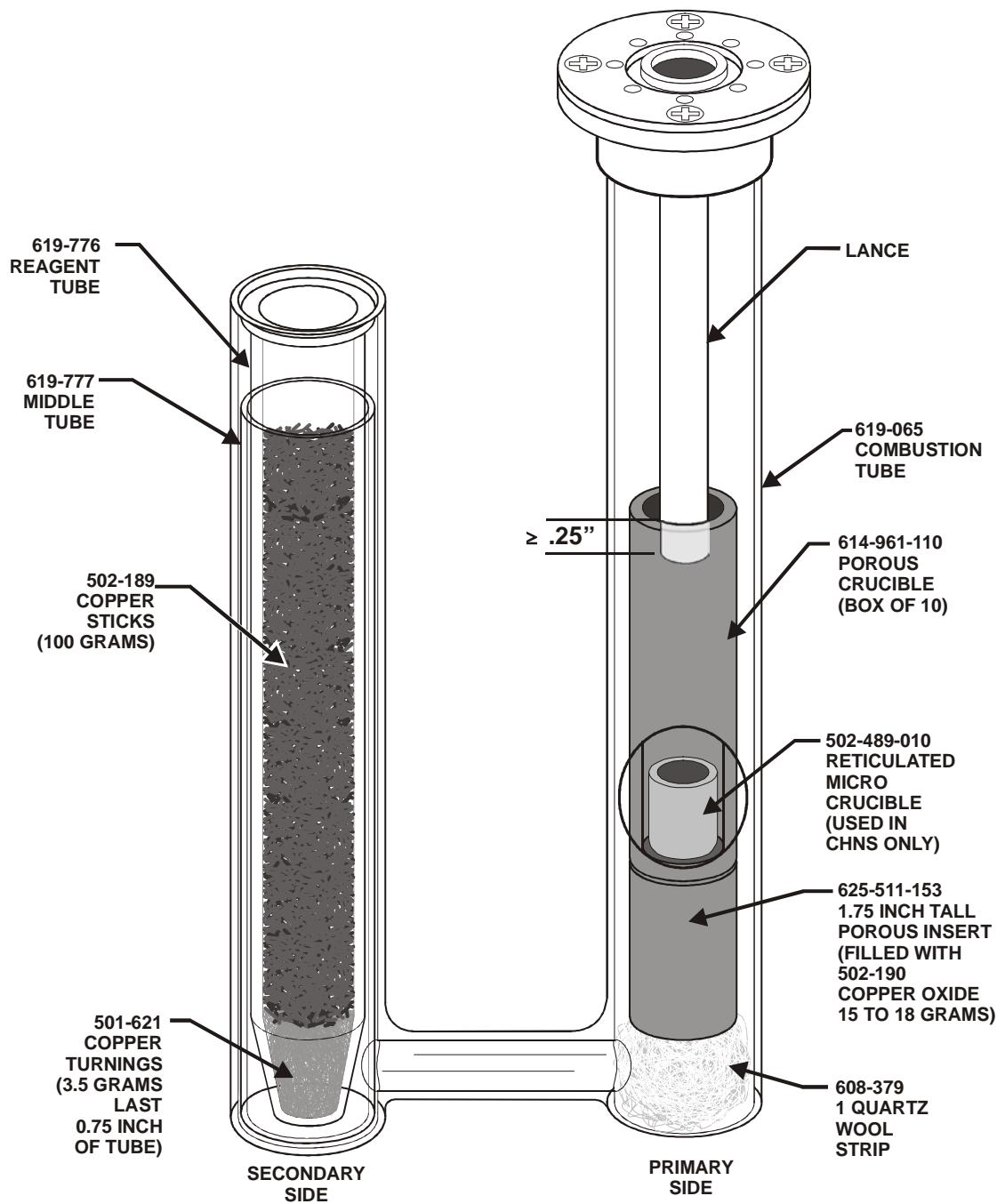
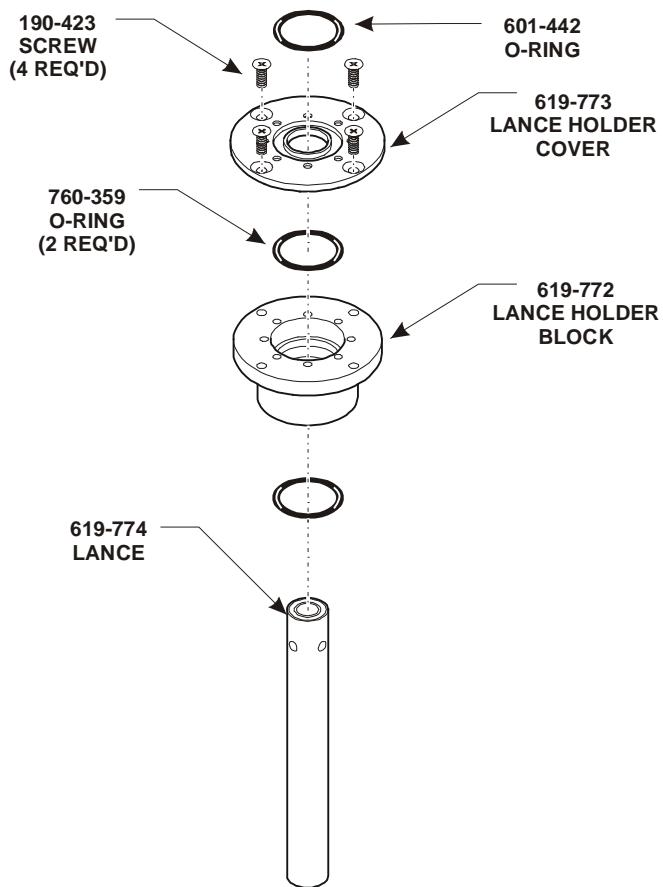


Figure 6-5
Alternate Combustion Tube Packing (Micro)

CHNS MICRO



CHN MACRO/MICRO

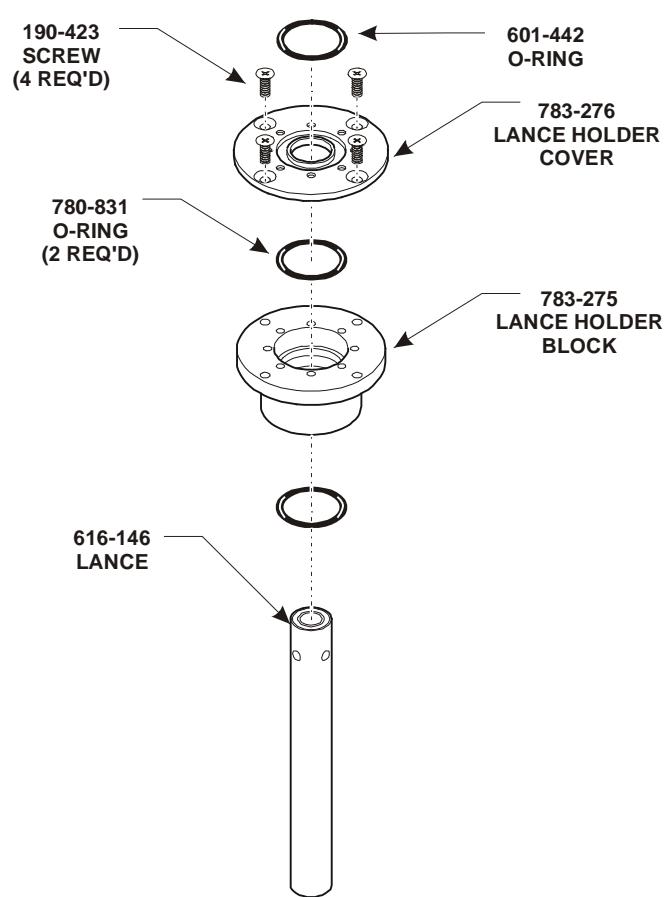


Figure 6-6
Lance Assemblies

Replacing the Crucible



HIGH TEMPERATURE HAZARD

The crucible and furnace may be hot. To avoid burns, allow the instrument to cool to room temperature before replacing the crucible.



If the furnace is not cooled to room temperature before replacing the crucible, the furnace will stop and need to be restarted.

1. Permit the furnaces to cool and shut down the instrument. Refer to the [Shutdown Procedure](#), page 5–10.
2. Remove the three screws securing the loading head to the furnace. Refer to [Figure 6-7](#), page 6–18.



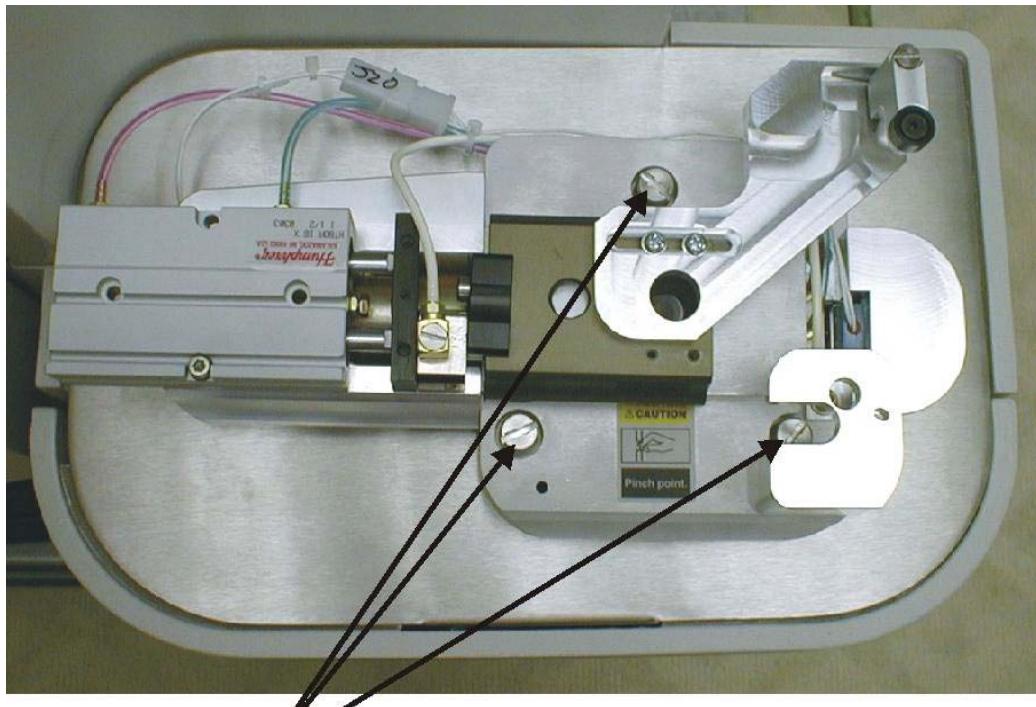
After the loading head is removed, be careful not to damage the electrical connector on the bottom.

3. Lift the loading head and set it aside. It is not necessary to disconnect the gas lines.
4. Screw the lance extractor tool into the small hole on the lance head and remove the lance. Refer to [Figure 6-8](#), page 6–18.
5. Place the lance and extractor tool inside the front door.
6. Using the crucible extractor tool, reach into the combustion tube and grasp the crucible. Lift the crucible out and discard when cool.
7. Using the crucible extractor tool, place a new crucible in the combustion tube and replace the lance and loading head.



To prevent damage to the loading head, properly align the electrical connectors before pushing the loading head onto the instrument.

8. In the Diagnostics/Furnace dialog box, in the Combustion Furnace section, select Restart to restart the furnace.
9. Allow the crucible to reach operating temperature.
10. Reset the crucible counter by accessing [Reset Maintenance Counters](#), page 6–38.
11. Run two blank analyses to purge air and moisture from the system.



LOADING HEAD
REMOVAL SCREWS

Figure 6-7
Loading Head Removal Screws

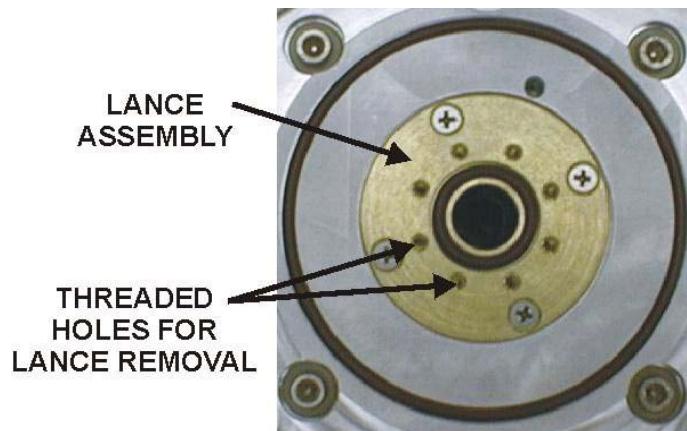


Figure 6-8
Lance Removal

Cleaning the Loading Head

Disassembly

1. Remove the three screws securing the loading head to the furnace, [Figure 6-7](#), page [6-18](#).



After the loading head is removed, be careful not to damage the electrical connector on the bottom.

2. Lift the loading head and set it aside. It is not necessary to disconnect the gas lines.
3. Release the quick disconnect block and remove the slide block by pulling it away from the loading head. Refer to [Figure 6-9](#), page [6-20](#).
4. Clean the inner surface of the slide block and piston. Refer to [Figure 6-10](#), page [6-20](#).
5. Clean and inspect the o-ring on the coupling block. Refer to [Figure 6-10](#), page [6-20](#).
6. Turn the loading head over so the bottom is facing up.
7. Locate the lance shield. Refer to [Figure 6-11](#), page [6-21](#).
8. Screw the lance extractor tool into one of the threaded holes and remove the shield.
9. Clean the lance shield.
10. Remove the female jaw. Refer to [Figure 6-12](#), page [6-21](#). Clean the jaw and the inside of loading head.

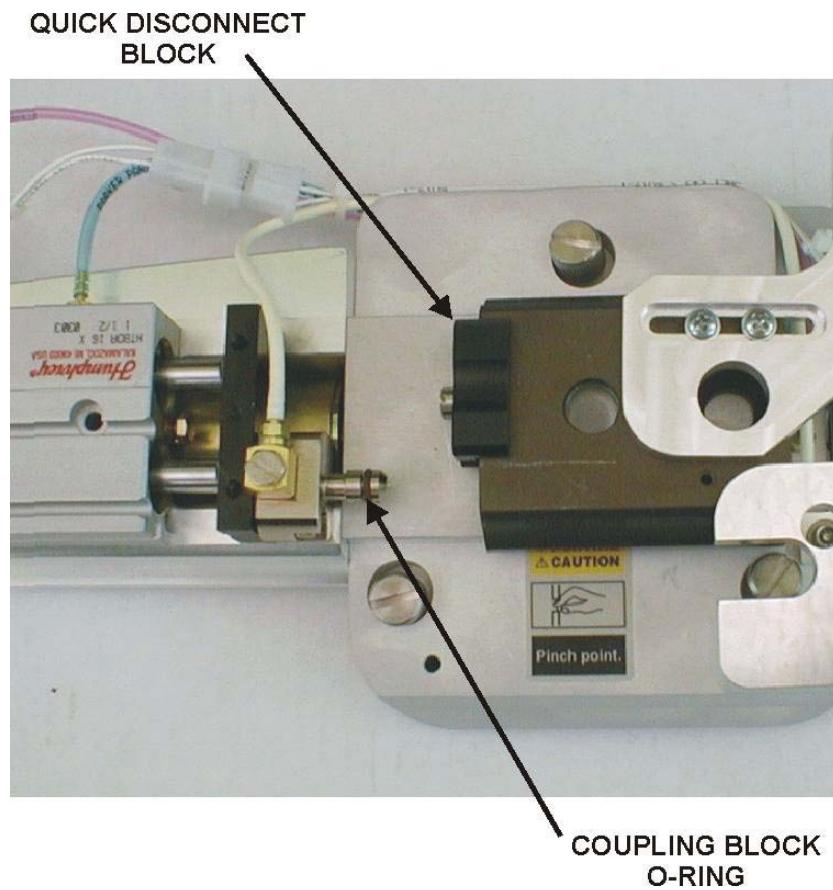


Figure 6-9
Slide Block Removal



Figure 6-10
Slide Block (Bottom View)

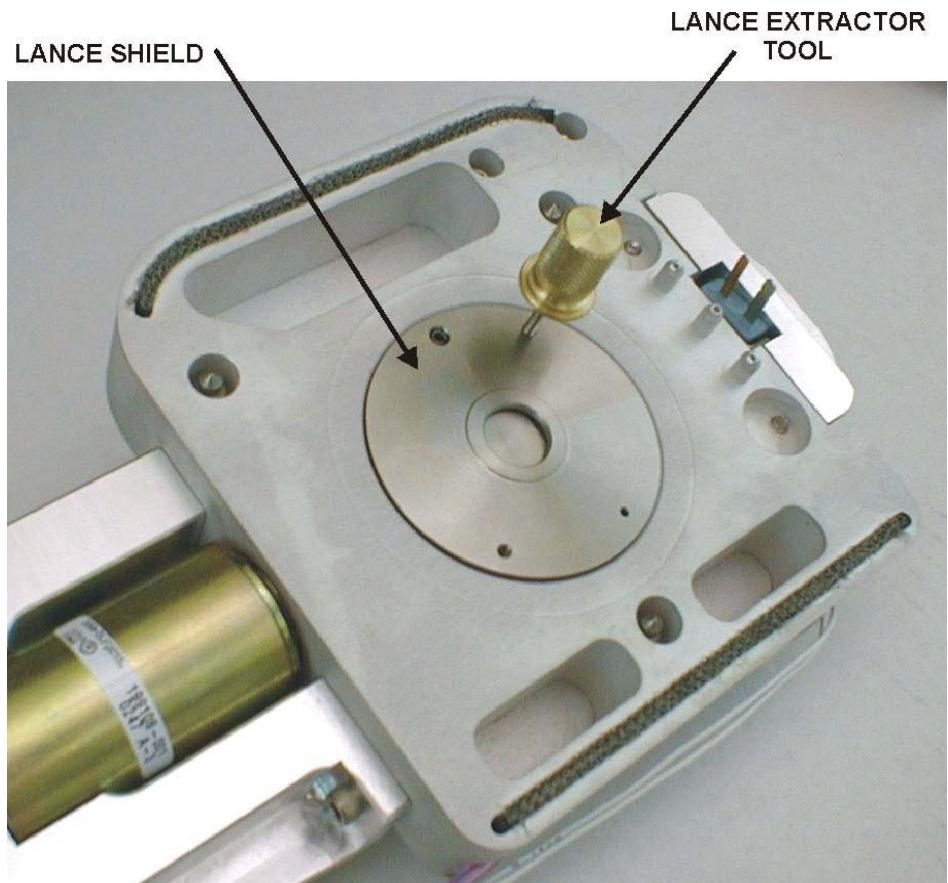


Figure 6-11
Lance Shield and Lance Tool

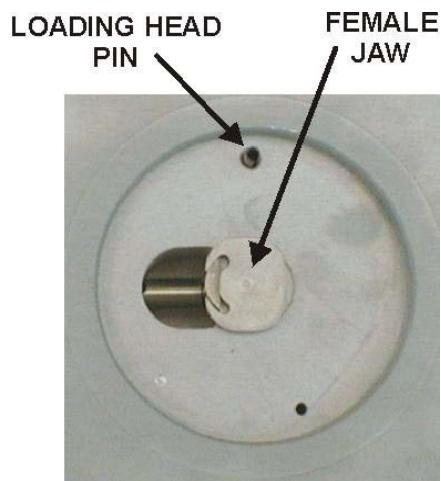


Figure 6-12
Female Jaw and Loading Pin

Reassembly

1. Insert the female jaw into the male jaw. Refer to [Figure 6-12](#), page [6-21](#).
2. Line the pin inside the loading head with the largest hole in the lance shield.
3. Apply a very light coat of vacuum grease to the o-ring on the lance shield
4. Press the lance shield into the loading head.
5. Turn over the loading head.
6. Push the slide block onto the loading head.
7. Line up the cylinder and slide block.
8. Latch the quick disconnect block to secure the cylinder to the slide block.
9. Reinstall the loading head onto the instrument. Be careful not to bend the electrical connector on the bottom of the loading head.

Packing the Reagent Tube

Replace reagents when the counter reaches its limit (approximately 200).

The reagent tube is also referred to as the measure flow scrubber and the helium scrubber.



Anhydrene is a strong dehydrating agent and potentially strong oxidant over 150°C. Do not heat with organic matter, flammables, or combustibles. Avoid contact with strong acids. Refer to Safety Data Sheet (SDS) for procedures.

Removing

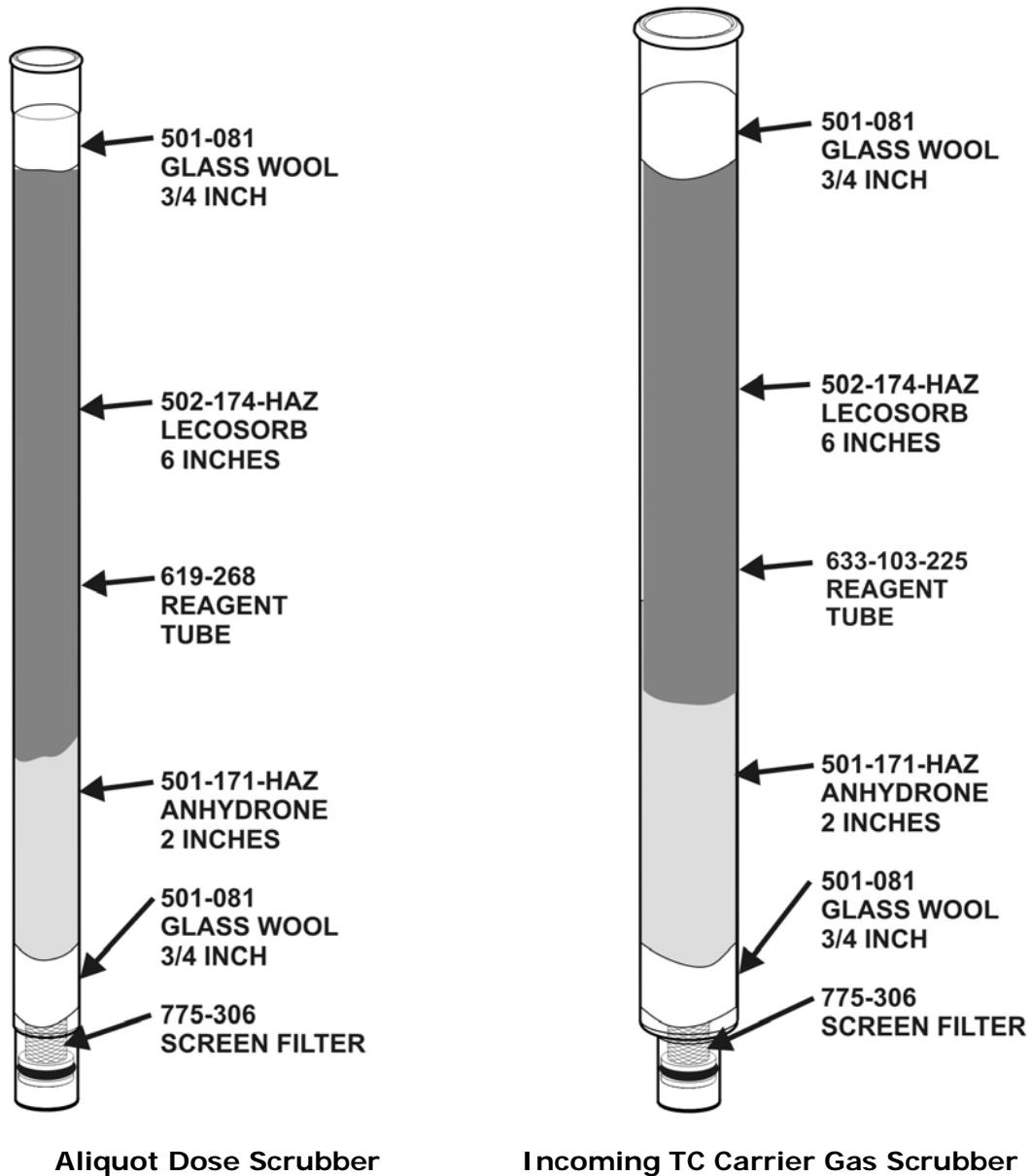
1. Turn Off the gas.
2. Slide reagent tube upward until the bottom end can swing free.
3. Tilt out the free reagent tube end.
4. Pull the reagent tube downward off the top port.

Packing

1. Before repacking the reagent tube, remove all material from the inside of the reagent tube, rinse the reagent tube with water, and let it dry.
2. Insert a screen filter into the bottom of the reagent tube. Position the o-ring toward the bottom and push the screen filter up into the reagent tube $\frac{1}{4}$ -inch. Refer to [Figure 6-13](#), page [6-24](#).
3. Pack $\frac{3}{4}$ -inch of glass wool into the bottom of the reagent tube.
4. Fill the bottom $\frac{1}{3}$ of the reagent tube with *Anhydrene*.
5. Fill the top $\frac{2}{3}$ of the reagent tube with *LECOSORB*.
6. Firmly pack $\frac{1}{2}$ -inch to $\frac{2}{3}$ -inch of glass wool into the top of the reagent tube.
7. Reinstall the reagent tube.
8. Reset the Reagent Tube Counter under [Reset Maintenance Counters](#), page [6-38](#).
9. Clean excessive reagent from work area.

Installing

1. Push the top end of the reagent tube over the top port.
2. Tilt the reagent tube inward and pull it down, pushing it over the bottom port.
3. Turn On the gas.



Aliquot Dose Scrubber

Incoming TC Carrier Gas Scrubber

Figure 6-13
Reagent Tube Packing

O-rings

When repacking the reagent tubes, catalyst heater tube, or cleaning an assembly, lubricate each o-ring with vacuum grease. O-rings should be replaced when cracked, dry, burnt, or torn. Do not over-lubricate the o-rings; apply only a light coating of grease.

1. Gently remove o-ring.
2. Lightly grease each o-ring making sure the grease is applied evenly without excess build-up.
3. Reinstall o-ring.

Packing the Reduction Heater Tube

NOTE → The reduction reagent materials should be replaced after approximately 1500 sample analyses if pure helium (99.99% or better) is used. If the helium carrier is contaminated with oxygen, the copper turnings will deplete in a shorter period of time.

1. Set the gas flow to standby.
2. Remove the aliquot dose reagent tube and replace it with the purge tube. Position the purge tube with the purge hole toward the top.
3. Select Diagnostics and select Furnace. The Furnace Diagnostics page will appear.
4. In the Reduction Heater Control Temperature dialog box select Stop to set the catalyst heater temperature to 20°C.
5. Wait 30 minutes for the reduction heater to cool.



WARNING

HIGH TEMPERATURE HAZARD

The catalyst heater tube is extremely hot. Wait for the catalyst heater tube to cool before removing it.

6. Loosen the Thumbscrew and tilt the reduction Heater Assembly forward. Refer to [Figure 6-14](#), page [6-27](#).
7. Lift the reduction heater tube and remove it from the reduction heater assembly.



WARNING

HIGH TEMPERATURE HAZARD

Set the catalyst heater tube aside on a cooling tray and allow the catalyst heater tube to cool to room temperature before proceeding.

8. Turn the reduction heater tube upside down and place a paper towel on the counter.
9. Tap the tube gently on the counter. The contents of the tube will slowly slide out.
10. Rinse or soak the reduction heater tube for two minutes with cold water. Tap the reduction heater tube on a waste container until the copper falls out.
11. Repack the clean or new reduction heater tube. Refer to [Figure 6-15](#), page [6-28](#).
 - A. Pack 1 inch of copper turnings into the bottom of the reduction heater tube.
 - B. Pack 1 $\frac{3}{4}$ -inches of N-catalyst on top of the copper turnings. It is only necessary to replace the N-catalyst every second repacking.
 - C. Pour $\frac{1}{4}$ -inch of copper turnings onto the N-catalyst.

NOTE → To prevent channeling and increase the number of analyses between reagent replacements, tap the reduction heater tube on the counter as you fill it. This will help ensure even depletion of the copper sticks.

- D. Fill the reduction heater tube with copper sticks.

12. Reinstall the repacked reduction heater tube into the reduction heater assembly. Verify the bottom end of the reduction heater tube is positioned and sealed over the o-ring.
13. Tilt the reduction heater assembly forward and tighten the knurled screw.
14. In the Reduction Heater Control Temperature dialog box, select Restart to set the reduction heater temperature.
15. Allow the catalyst heater tube to reach operating temperature. This should take 10 to 15 minutes.
16. Set the gas flow to Analyze and wait about 2 minutes for the gas to escape out the purge tube hole.
17. Remove the purge tube and engage the top of the reagent tube. Allow three seconds to elapse to the engage the bottom end of the reduction heater tube.
18. Reset the Reduction Maintenance Counter under [Reset Maintenance Counters](#), page [6-38](#).
19. Run several blanks analyses before beginning sample analysis.



Figure 6-14
Reduction Heater

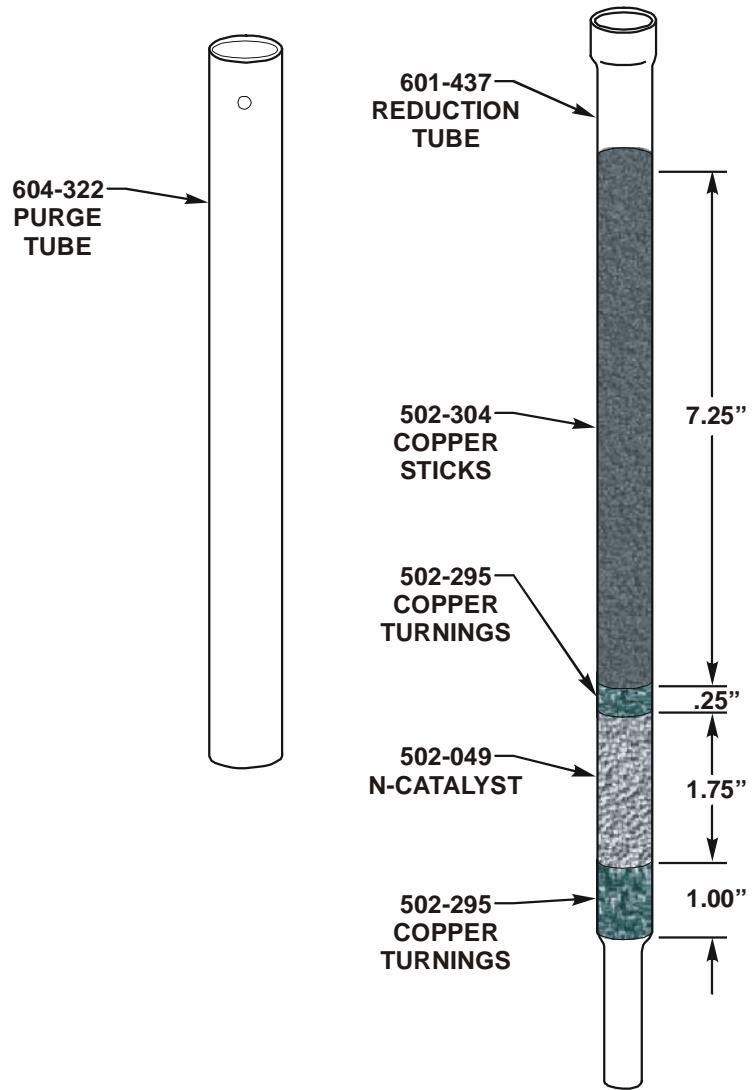


Figure 6-15
Packing the Reduction Heater Tube

Cleaning the Screen Filter

NOTE → The screen filters are located in the bottom of the reagent tubes. The filters should be cleaned whenever the reagents are replaced.

Removal

1. Turn Off the gas.
2. Slide the reagent tube upward until the bottom end can swing free. Refer to [Figure 6-13](#), page [6-24](#).
3. Tilt out the free reagent tube end.
4. Pull the reagent tube downward off the top port.

Cleaning

1. Remove the o-rings from the screen filters.
2. Inspect, clean, and lightly grease the O-rings. If they are cracked or worn, replace them. Set the o-rings aside.
3. Insert the screen filters in an ultrasonic cleaner.
4. Sonicate the screen filters for 10 minutes.
5. Remove the screen filters from the ultrasonic cleaner and let air dry.
6. Install the o-rings on the screen filters.
7. The screen filters can be inserted into the reagent tubes or stored for later use.

Install

1. Push the top end of the reagent tube over the top port.
2. Tilt the reagent tube inward and pull it down, pushing it over the bottom port.
3. Turn On the gas.

Removing and Replacing the Combustion Tube

1. Refer to the [Shutdown Procedure](#), page 5–10, and turn Off the instrument.



HIGH TEMPERATURE HAZARD

The combustion furnace is extremely hot. Wait for the combustion tube to cool before removing it.

2. Disconnect the instrument from facility AC power.



HIGH VOLTAGE HAZARD

This equipment operates from a 230V~ source. Contact with this voltage can be fatal. Disconnect the instrument from the facility AC power source before continuing with this procedure.

3. Refer to [Replacing the Crucible](#), page 6–17, and remove the loading head.
4. Remove the furnace top shelf.
5. Refer to [Replacing the Crucible](#), page 6–17, and remove the lance assembly.
6. Grab the top left corner of the furnace door and pull it open.
7. Remove the four screws in the loading head interface block and remove the block. Refer to [Figure 6-16](#), page 6–31.
8. Remove the afterburner cap. Refer to [Figure 6-16](#), page 6–31.
9. Remove the four screws in the afterburner interface block and remove the block. Refer to [Figure 6-17](#), page 6–32.
10. Pull the furnace latch pin out and tilt the bottom of the furnace toward the front of the instrument. Release the latch pin, lift the furnace up and pull the furnace toward you. When the furnace is pulled out as far as it will go (about 2 inches), tilt the bottom of the furnace up until the latch pin snaps and locks the furnace into place. Refer to [Figure 6-18](#), page 6–32.
11. Remove the two screws securing the furnace bottom assembly and remove the bottom assembly. Refer to [Figure 6-19](#), page 6–33. Set it on the inner shelf of the furnace door. There will be an electrical connection attached to the furnace fan.
12. Wearing gloves, pull the combustion tube out through the bottom of the furnace.
13. Refer to the [Packing the Combustion Tube](#), page 6–12, and repack the combustion tube.



POSSIBLE COMBUSTION TUBE DAMAGE

Do not touch the lower portion of the combustion tube without gloves. Body oil can promote devitrification that may cause the combustion tube to crack.

14. Insert the combustion tube into the furnace. The short end of the tube should be inserted into the afterburner side of the furnace.

15. If the height of the combustion tube needs to be raised, perform the following steps. If the furnace has been heated, the combustion tube o-rings may be deformed and should be replaced.



COMBUSTION TUBE HEIGHT ADJUSTMENT

Perform the next steps to adjust the height of the combustion tube. If the combustion tube height is correct, skip to step 17C.

16. Loosen the combustion tube stop on the bottom of the furnace assembly. Refer to [Figure 6-19](#), page [6-33](#).

17. Install the furnace bottom assembly.



NOTE Verify the tabs on bottom of the furnace are overlapped as shown in [Figure 6-19](#), page [6-33](#).

- A. Raise the combustion tube stop until resistance is met.
- B. Tighten the combustion tube stop screw.
- C. Reinstall the afterburner interface block using the four screws that were removed from the block. Refer to [Figure 6-17](#), page [6-32](#).

18. Reinstall the afterburner cap. Refer to [Figure 6-16](#), page [6-31](#).

19. Reinstall combustion block, crucible, and lance.

20. Reinstall the combustion tube furnace.

21. Reinstall loading head.

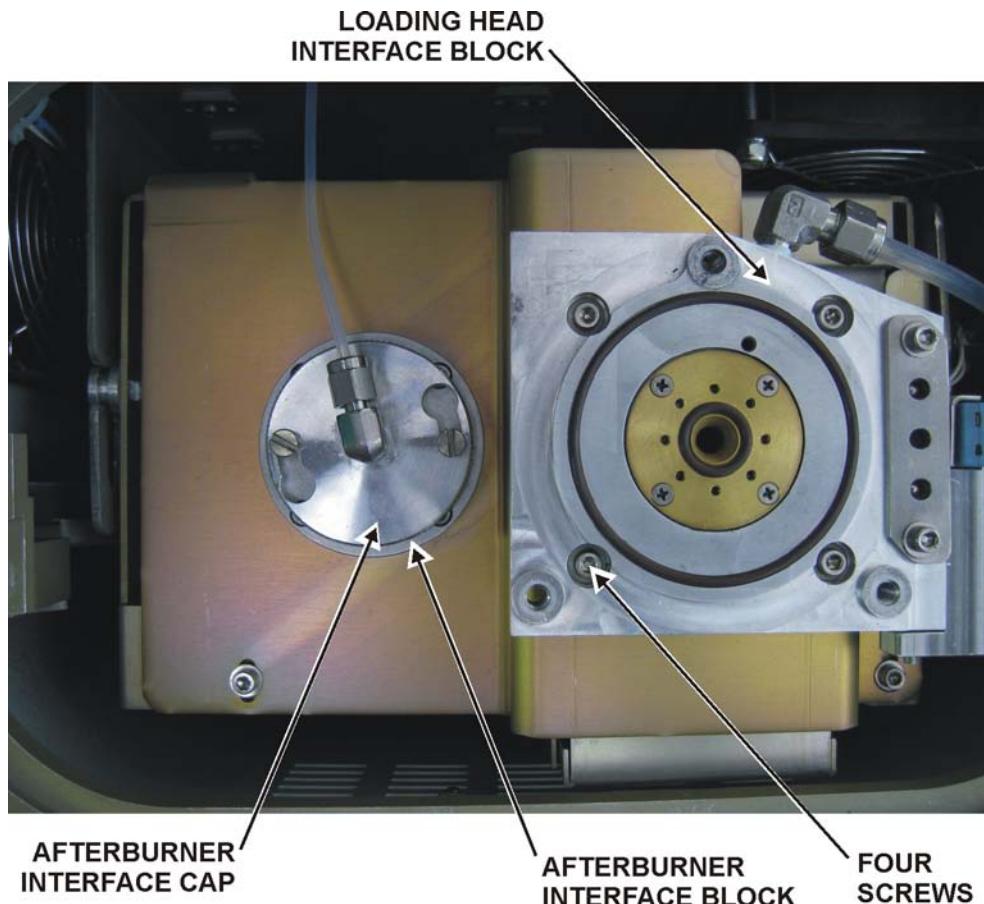


Figure 6-16
Furnace Interface Blocks

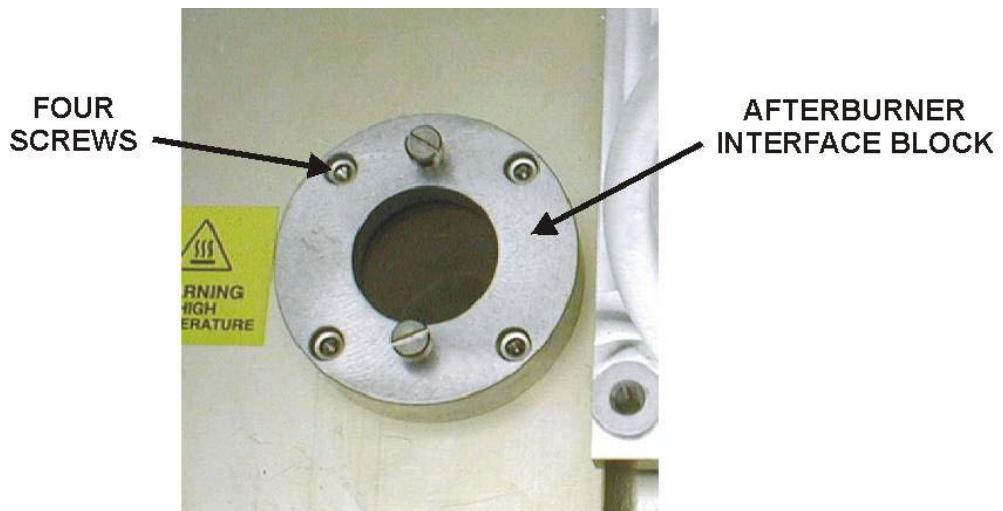


Figure 6-17
Afterburner Interface Block

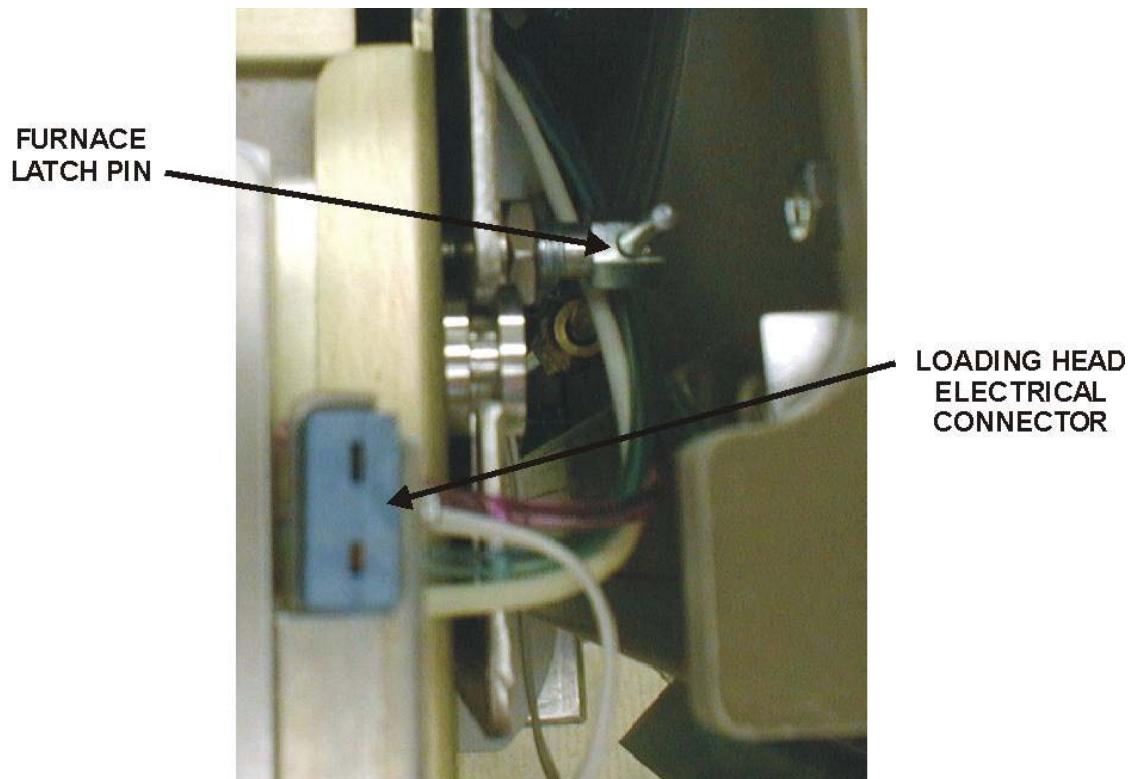


Figure 6-18
Furnace Latch Pin

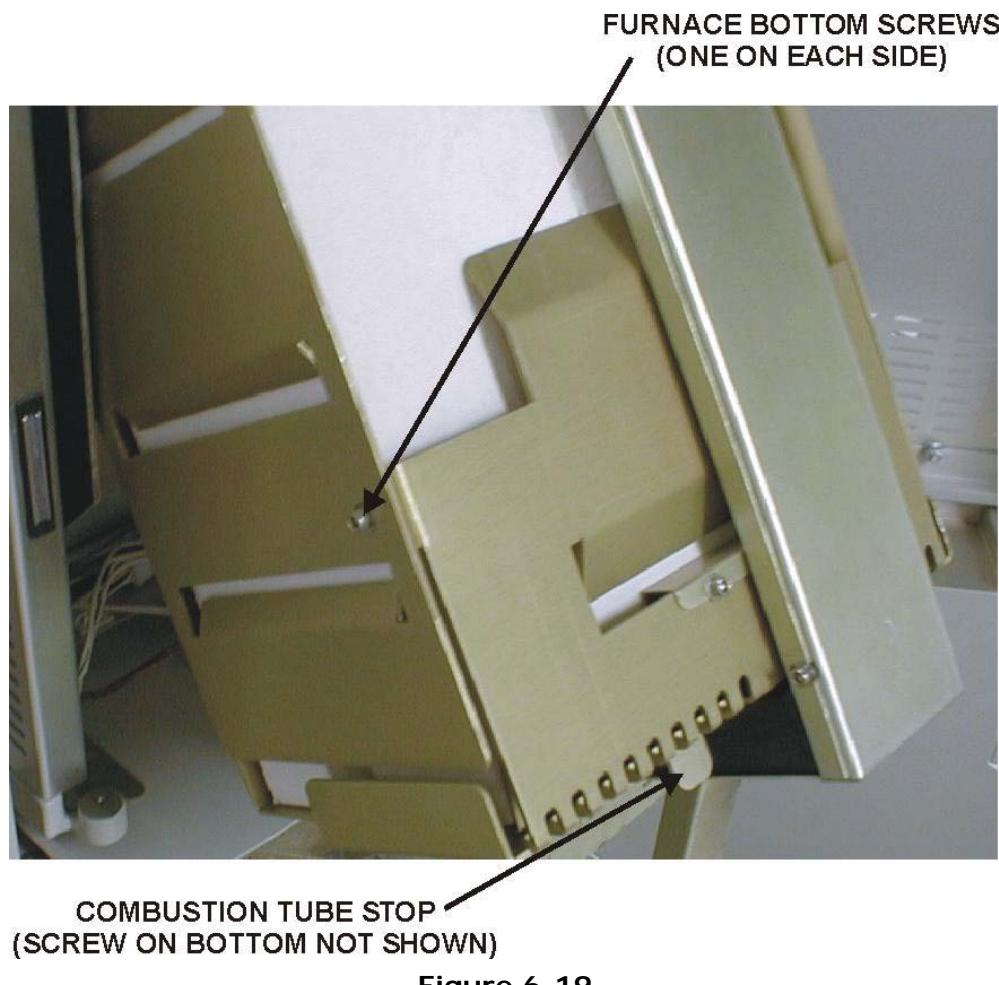
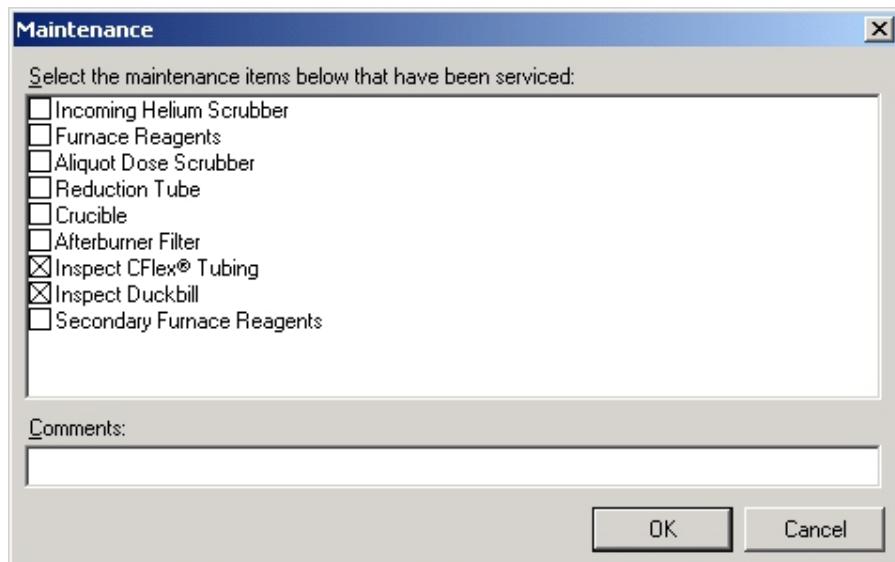


Figure 6-19
Combustion Furnace Assembly

Logging in Periodic Maintenance

After periodic maintenance has been performed, follow the instructions in this section to log in the maintenance. This creates a periodic maintenance history file, sets the analysis counter back to zero, increments the reset counter, enters the reset date, and enters any comments.

1. From the Maintenance menu, select Login. The Maintenance dialog box will appear.



2. Select the checkbox before the item that periodic maintenance was performed on.
3. Select on the Comments box and enter any maintenance comments.
4. Select OK.

Viewing Log File

The log file is a history of past events. Every time one of the following procedures is performed, it will be recorded in the log file.

- Change of Mass by Operator
 - Data Out of Range (Ambient Monitor parameter values)
 - Date of last calibration, drift or blank
 - Date scheduled maintenance is performed
 - Network Errors
 - Network Sign-on Errors
 - Sample Aborted
 - Sample Deleted
 - Standard check out-of-range
1. From the Maintenance menu, select View Log Files. The Log File window will appear.

The screenshot shows a Windows-style dialog box titled "Log File". The table has columns: Time, Object, Action, Name, and Details. The details column contains a scrollable text area with event logs. One entry in the details column is highlighted with a red box.

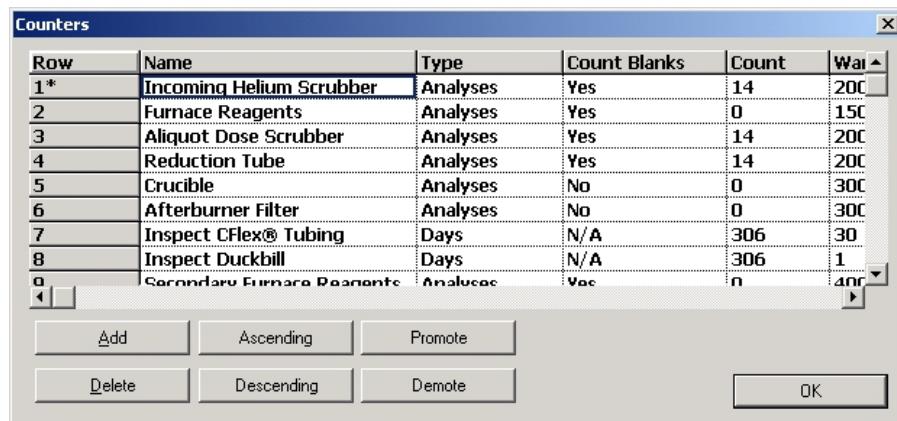
Time	Object	Action	Name	Details
1/10/2003 9:22:54 AM	Sample	Deleted	Soil	
1/10/2003 9:22:54 AM	Sample	Deleted	Soil	
1/10/2003 9:22:54 AM	Sample	Deleted	Soil	
1/10/2003 9:22:54 AM	Sample	Deleted	Soil	
1/10/2003 9:22:53 AM	Sample	Deleted	Soil	
1/10/2003 9:21:37 AM	Sample	Deleted	Soil	
1/9/2003 10:08:10 AM	System Parameters	Modified	System Parameters	Number of Autoloader Hotels "Sample mass was 1.3971g now 0.9846g"
1/8/2003 11:02:27 AM	Sample	Modified	Soil	
1/8/2003 11:00:27 AM	Sample	Deleted	Sample-1	
1/8/2003 9:34:16 AM	Sample	Deleted	Blank	
1/8/2003 9:34:16 AM	Sample	Deleted	Blank	
1/8/2003 9:34:15 AM	Sample	Deleted	Blank	
1/8/2003 9:33:39 AM	Sample	Deleted	Sample-1	
1/8/2003 9:33:35 AM	Sample	Deleted	Sample-1	

2. Select Print to receive a printout of the log file on the system printer.
3. Select OK when finished.

Configuring Maintenance Counters

Maintenance Counters is a list of components and assemblies, within the instrument, that have been determined to require periodic maintenance. An analysis counter will determine when periodic maintenance is needed and alert the operator. After maintenance, a history log of maintenance performed is automatically generated. For information concerning periodic maintenance and procedures, refer to the [Periodic Maintenance Schedule](#), page 6–5. The counters should not be reset from this procedure. To reset the counters, refer to [Reset Maintenance Counters](#), page 6–38.

1. From the Configuration menu, select Counters. The Counters dialog box will appear.



2. Select Add to define a maintenance counter.
3. Enter the information required in the dialog box. Refer to [Maintenance Counter Definitions](#), page 6–37, for additional information.
4. To remove a counter, select it and select Delete. Only counters added by the operator can be removed.
5. To arrange the counter in ascending (A to Z) alphabetical order, select Ascending.
6. To arrange the counter in descending (Z to A) alphabetical order, select Descending.
7. To move a counter up toward the top of the screen, select the counter and select Promote.
8. To move a counter down toward the bottom of the screen, select the counter and select Demote.
9. Select OK.

Maintenance Counter Definitions

Name—A name or description of the component or assembly that requires periodic maintenance.

Count Blanks—If Yes is entered and a blank is analyzed, the analyses counter will increment. If No is entered and a blank is analyzed, the analyses counter will remain at the same value.

Stop—The determined number of analyses that the analyses counter can reach before the instrument will automatically stop and prevent continued analysis. To turn this function off, enter 0.

Warning—The determined number of analyses that the analyses counter can reach before a warning message is displayed alerting the operator that periodic maintenance is necessary. Analysis will not stop when this counter limit is reached. To turn this function off, enter 0.

Analyses—The total number of samples analyzed.

Resets—The number of times that the maintenance item was serviced. The resets counter is incremented every time a maintenance item is checked in the Maintenance dialog box.

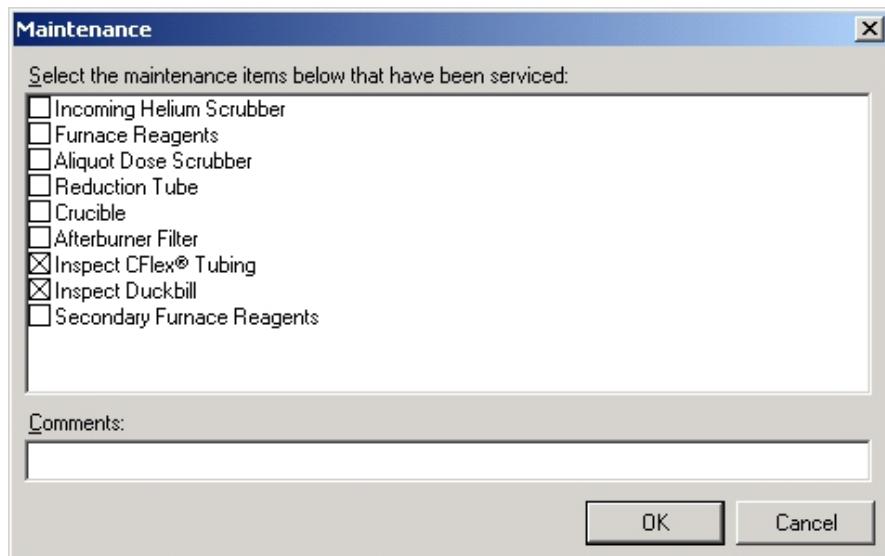
Reset—Displays the date and time the maintenance counter was reset.

Comments—A place for the operator to add notes or comments concerning maintenance.

Reset Maintenance Counters

Reset Maintenance Counters is used to reset the counters back to zero. After maintenance, a history log of maintenance performed is automatically generated. This information is used to create that history log file.

1. From the Maintenance menu, select Login. The Maintenance dialog box will appear.



2. Select the item(s) that maintenance has been performed on.
3. Select OK.
4. A Confirmation dialog box associated with every counter will appear.
 - A. Select Yes if maintenance was performed.
 - B. Select No if maintenance was not performed.
 - C. Select Cancel to exit procedure.
5. The Confirm dialog box for the second maintenance item will appear.
 - A. Select Yes if maintenance was performed.
 - B. Select No if maintenance was not performed.
 - C. Select Cancel to exit procedure.
6. Continue until all maintenance items were displayed in the Confirm dialog boxes and answer Yes, No or Cancel to the procedure.

7

Theory of Operation

The Theory of Operation chapter provides an overview of how the instrument operates and the stages of operation that generate reliable results.

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Illustrations

Figure 7-1 <i>TruSpec Micro Measurement Flow Diagram</i>	7-4
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Theory of Operation

NOTE → As you read this section, refer to the [TruSpec Micro Measurement Flow Diagram](#), page [7–4](#).

The efficiency and speed of the TruSpec® Micro CHN and CHNS is a result of the unique combination of a flow-through carrier gas system used in conjunction with individual highly selective, infrared (IR) and thermal conductivity detection systems.

A weighed micro sample is placed into the autoloader of the *TruSpec* Micro and is automatically dropped into the high temperature combustion furnace, allowing the sample to combust. This combustion converts carbon to CO₂, hydrogen to H₂O, nitrogen to N₂, and sulfur to SO₂. The combustion gases are swept from the furnace, through scrubbing reagents, and onto the detection systems as they are being released. Independent IR detectors are used for simultaneous detection of carbon, hydrogen, and sulfur. Nitrogen is measured using a thermal conductivity detection system. The entire analysis cycle is complete in approximately 4 minutes.

The optional micro oxygen add-on module enables the *TruSpec* Micro to determine oxygen content in organic matrices and is compatible with the both the *TruSpec* Micro CHN and CHNS models. Samples being analyzed for oxygen are placed into the autoloader of the micro oxygen add-on module and automatically dropped into a high-temperature pyrolysis furnace. The oxygen released during pyrolysis of the sample reacts with a carbon-rich environment in the furnace to form CO. The CO is swept from the furnace and converted to CO₂ before measurement via infrared detector (approximately 1 minute analysis time).

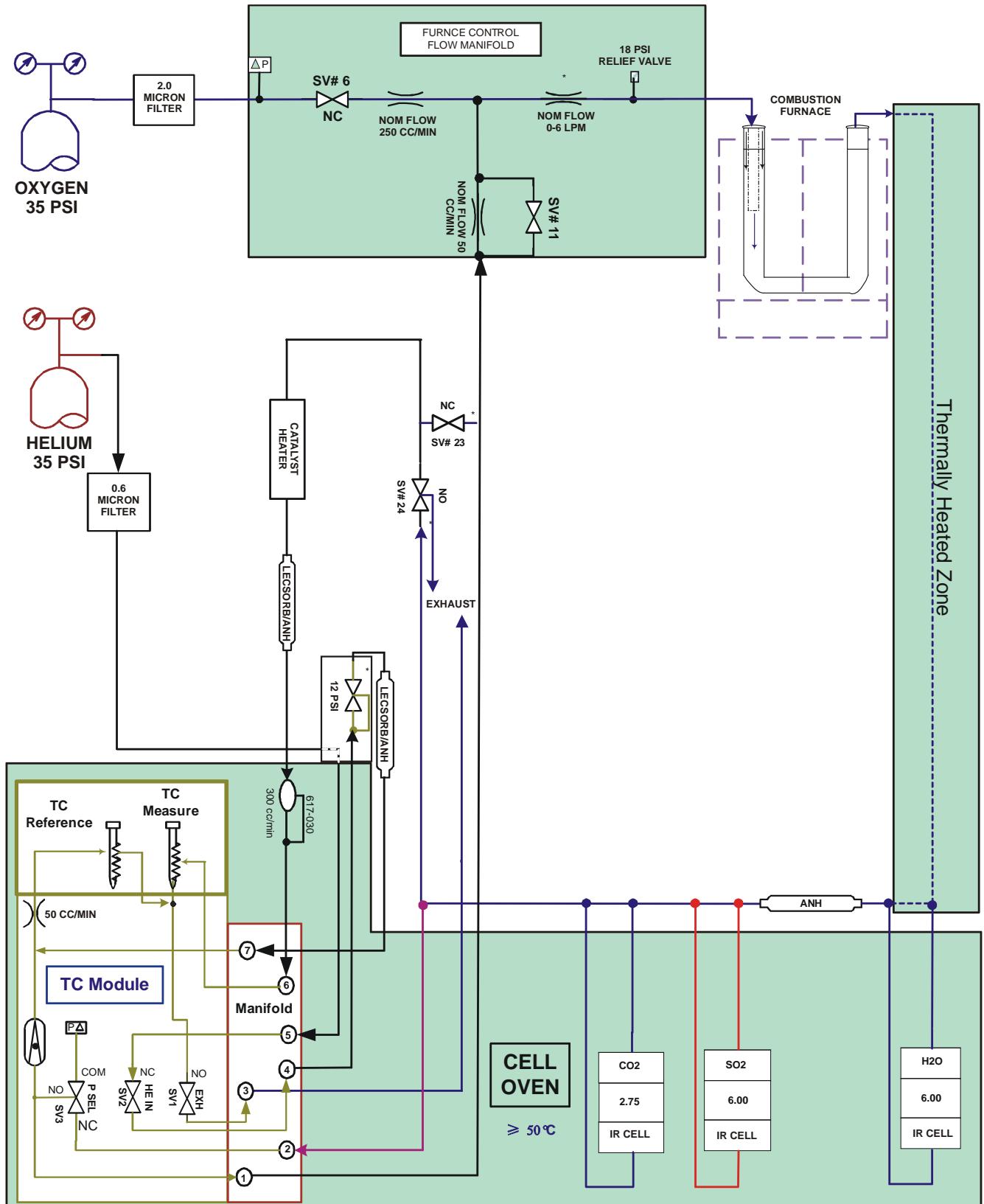


Figure 7-1
TruSpec Micro Measurement Flow Diagram

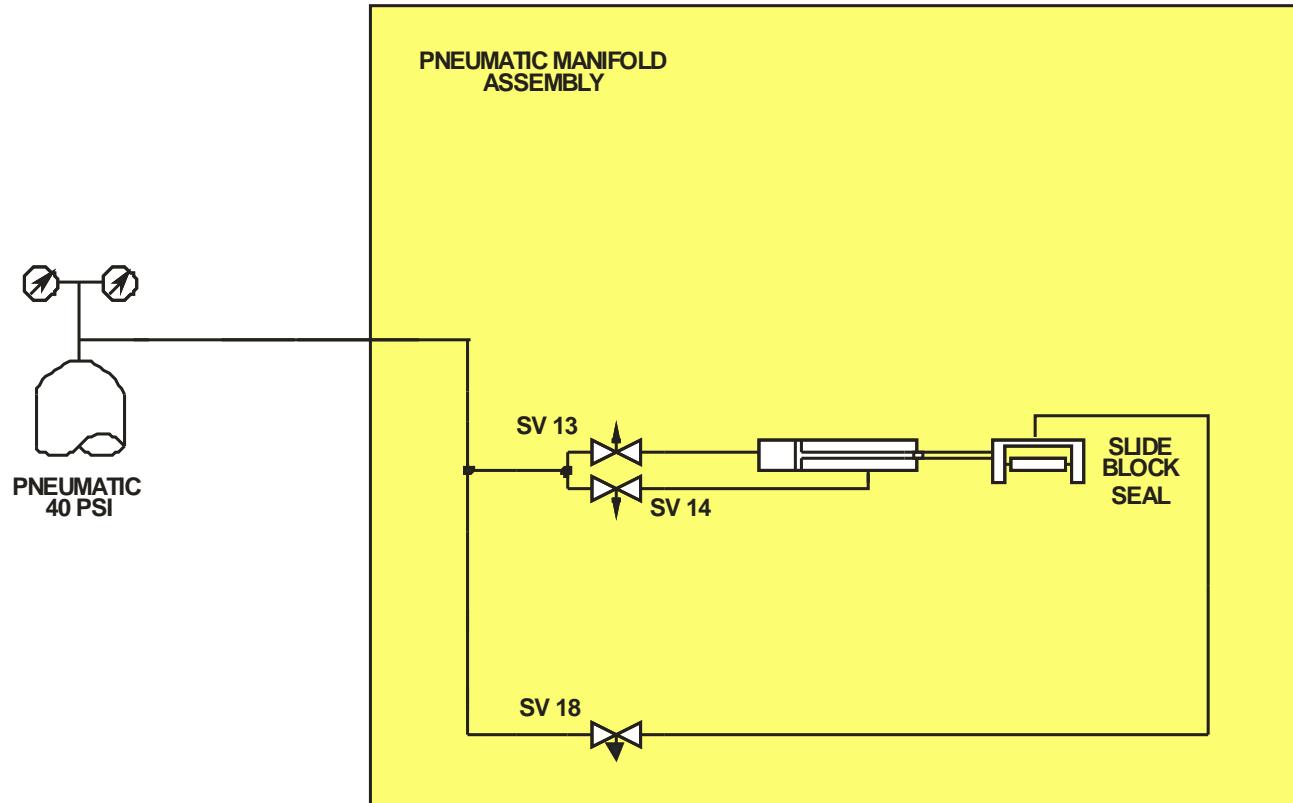


Figure 7-2
Pneumatic Flow Diagram

Method of Standard Additions

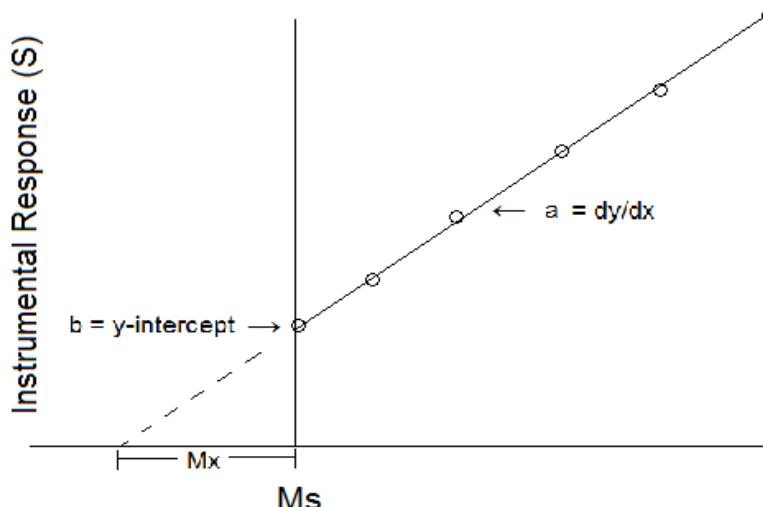
The method of standard additions is a common method for determining analyte concentrations in complex matrices such as soils, biological fluids, etc. Matrix interferences and background for many such samples may result in interferences with analyte signal that cause inaccurate determination of analyte concentration. The background may be determined by adding analyte to the sample and measuring the instrumental response. The difference between sample and spiked sample is assumed to be due only to change in analyte concentrations.

A simple procedure is generally used in which the sample is spiked at several increasing concentrations of analyte. The samples are analyzed and the response plotted with the standard added plotted on the x-axis and instrumental response on the y-axis. The slope (a) and y-intercept (b) are determined through linear regression analysis of the calibration curve.

$$S = aM_s + b \quad (1)$$

where: S = instrumental response (signal)

M_s = volume of standard



The mass of standard $M_s(0)$ from that point to the first solution on the curve ($x = 0$) contains the same amount of analyte as the sample. So:

$$M_{xcx} = [M_s(0)]c_S \quad (2)$$

where: M_x = mass of the sample aliquot

c_x = concentration of the sample

c_s = concentration of the sample

Combining equations 1 and 2 and solving for c_x :

$$c_x = (bc_s/aM_x)$$

The analyte concentration can then be calculated from the slope and intercept of the standard addition calibration curve.

As an example, this technique can be used to determine the unknown concentration of the nitrogen content in aqueous standards.

Barometric Pressure

Barometric pressure, which directly affects gas volume, is sensed by a pressure transducer. The barometric pressure transducer constantly monitors the pressure and feeds this information to the software. The software uses this information to compensate analysis results. During initial setup, the barometric pressure transducer is calibrated by entering the current actual barometric pressure.

Pressure is often reported in inches of mercury (Hg) which must be converted to millimeters (mm) of mercury. To convert from inches of Hg to mm of Hg, multiply the barometric pressure by 25.4.

Pressure varies inversely with altitude and, if pressure readings are measured and reported from an altitude other than operation, adjustments should be made accordingly. The following table illustrates that as altitude increases, pressure decreases.

Altitude	Pressure (mmHg)
0	760
250	753
500	746
750	740
1,000	733
2,000	707
3,000	681
4,000	656
5,000	632
6,000	609
7,000	586
8,000	564
9,000	543
10,000	523

Adjust reported level to reflect the operation level with this formula:

$$\frac{\text{Operation Pressure} \quad (\text{from table})}{760} \times \text{Reported Barometric Pressure at 0 feet} = \text{Adjusted Pressure at Operation}$$

Enter the answer to this formula in the barometric pressure procedure.

Example

Barometric pressure is reported at 750 mmHg at sea level (0 feet) but operation altitude is 1000 feet. Adjust the reported sea level pressure to operation level pressure by using the formula:

$$\frac{733 \text{ mmHg}}{760 \text{ mmHg}} \times 750 \text{ mmHg} = 723 \text{ mmHg}$$

In this example, the barometric pressure to be entered into the instrument is 723 mmHg.

Thermal Conductivity Cell

The thermal conductivity cell has the ability to detect differences in the thermal conductivity of gases. Refer to [Table 7-1](#), page [7-9](#). This TC cell is operated in a nitrogen optimized mode. The cell consists of two pair of matched filaments used in four legs of a Wheatstone bridge. The "reference" filaments are maintained in a constant gas and gas flow environment while the "measure" filaments are maintained in a constant gas flow environment, but the gas composition is allowed to vary. All filaments are mounted in an insulated metal block. A Filament Current Factor is calculated by the software to compensate for changes in the filament current due to TC cell temperature changes.

The Wheatstone bridge is balanced with a specified bridge current while both filaments are essentially in identical environments.

The bridge current causes self-heating of the filaments. The temperature of the filaments is always much higher than the oven temperature in which the cell is located.

As long as both filaments remain in the same environment under which the bridge was balanced, the bridge output will remain at approximately 0.3 volts. Any disturbance of this environment will result in a change in bridge output. The bridge output is AC coupled to amplifiers that have an output offset.

Once the bridge is balanced and stabilized under proper conditions, the only variations in bridge output are due to variations in the type and quantity of gas present at the "measure" filaments. The bridge is balanced with Helium (He) flowing in the measure chamber and reference chamber. The introduction of nitrogen causes the temperature of the measure filaments to increase since nitrogen has a lower thermal conductivity than helium. In this instance, the bridge becomes unbalanced and an output becomes available to the preamp, resulting in a positive reading. The amount of nitrogen determines the magnitude of the readings. The sensitivity of the system is governed by bridge current and the difference in thermal conductivity between the analyze gas, nitrogen, and the carrier gas, helium.

Gas	Symbol	Molecular Weight	Thermal Conductivity
Hydrogen	H ₂	2	39
Helium	He	4	33
Neon	Ne	20	10.4
Oxygen	O ₂	32	5.7
Nitrogen	N ₂	28	5.6
Air (dry)	Air	29	5.4
Carbon Monoxide	CO	28	5.4
Water Vapor	H ₂ O	18	4.0
Argon	Ar	40	3.8
Carbon Dioxide	CO ₂	44	3.3
Sulfur Dioxide	SO ₂	64	1.6

Table 7-1
Thermal Conductivity of Gases

Infrared Radiation Cell

The descriptions that follow refer to CO₂ optimized detector. The analysis of hydrogen is identical with only the necessary change to accommodate a different gas (H₂O).

The infrared source (IR) consists of nichrome wire, which is resistance-heated to 850°C. The IR source radiates visible energy as well as all wavelengths in the infrared spectrum.

Carbon dioxide absorbs IR energy at a precise wavelength within the IR spectrum. Energy from the IR source is absorbed as the gas passes through the cell, preventing it from reaching the IR detector. All other IR energy is prevented from reaching the IR detector by a narrow band-pass filter. Because of the wavelength filter, the absorption of IR energy can be attributed only to carbon dioxide (CO₂). The concentration of CO₂ is detected as a level of energy at the detector.

One IR Cell is used as both a reference and for measurement. The total carbon, as carbon dioxide, is detected on a continuous and simultaneous basis. The cell consists of an IR source, a narrow band-pass filter, a condensing cone, an IR energy detector, and the cell body. Radiated energy enters the cell body through a window, travels through the cell body, and then exits through a second window and a precise wavelength filter. The selective filter passes only the CO₂ absorption wavelength into a condensing cone that concentrates the energy at the detector. The solid state detector is AC coupled to a preamplifier. As the gas concentration increases, the voltage to the preamp decreases.

The starting reference level, or "baseline," for the detector is established by running 100% oxygen through the cell. The pure oxygen environment permits the maximum amount of energy to reach the detector. This maximum energy level is AC coupled to the preamp where it is amplified, rectified and filtered. It is then sent to an analog-to-digital (A/D) converter where it is converted to a digital signal.

As analysis begins, the cell output decreases with the amount of carbon (as CO₂) present in the cell. The computer reads the cell output and produces data points that are stored in memory. The computer then processes the curve, or graph, formed by these data points and after calibration forms a linear curve. The calibration curve is then used by the computer to accurately calculate the sample result.

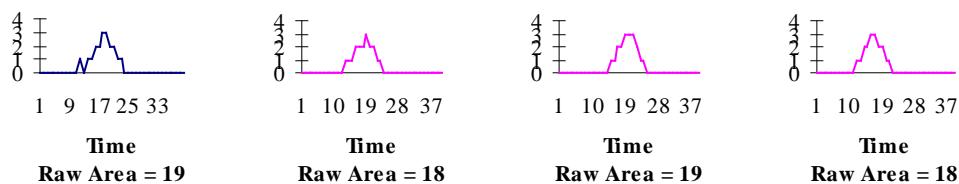
Theory of Calibration

Calibration compensates for differences between the total element measured and the actual element concentration. A programmed equation will correlate the response between the observed and theoretical measurement of analyte, permitting accurate measurements to be made.

The Microsoft® Windows® software provides several types of calibration curves. The calibration curves include single standard calibration, linear, quadratic, and cubic. First perform a blank calibration; then once a standard calibration has been defined, re-calibration is not necessary unless a cell or flow has been changed. The daily routine will consist of determining the blank and performing a drift correction.

The first step to be performed is the determination of a method specific blank.

Several blanks should be analyzed. The linearization table is applied to the peak during the analysis. The area under the peak is calculated and stored as a raw area (Ar).

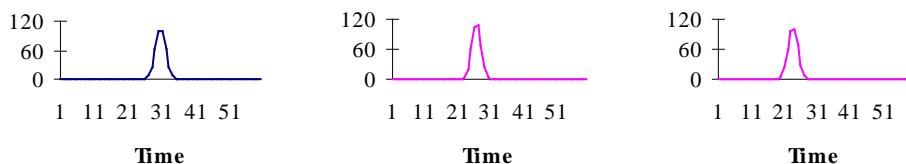


If the four blanks displayed previously were selected in the software to calculate a blank, the result would be that the average of the four would be stored as the blank area (Ab).

$$Ab = \frac{19 + 18 + 19 + 18}{4} - 18.5$$

The blank area, Ab, will be subtracted from every sample analyzed after it is set.

After the blank is defined, a calibration curve needs to be defined. Several standards need to be selected that will cover the operating range of analyte concentration for the samples of unknown analyte concentration. At least three replicates of each standard should be analyzed. Care must be taken to accurately compensate for trapped atmosphere, atmospheric blank, with each analyzed standard. If the calibration curve is constructed using more than one sample type, the atmospheric blank must be determined for each standard. This can be accomplished by analyzing the same sample mass encapsulated and in an open container, dissolving in water, or palletizing the sample. The difference in the results is the atmospheric blank.



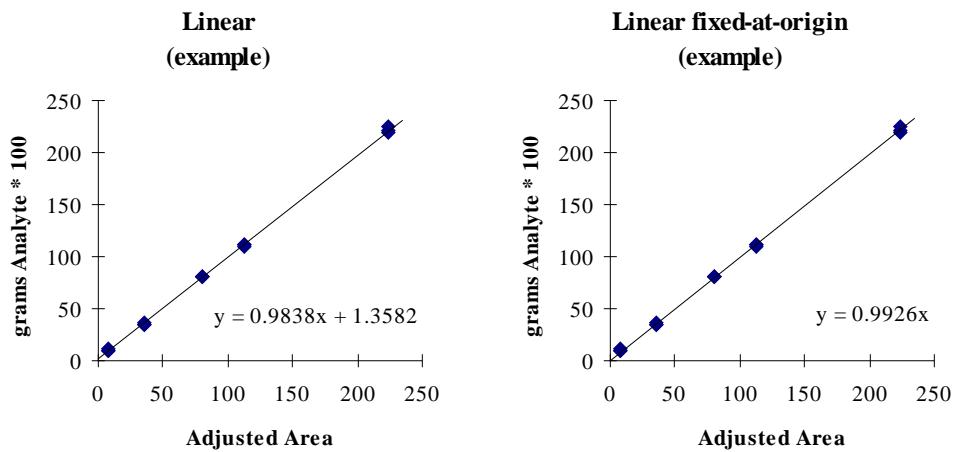
The area under the peak is calculated and stored as a raw area, Ar. The current blank area, Ab, is subtracted from the raw area, Ar, of the standard to yield the Area, A.

$$A = Ar - Ab$$

The area, A, is adjusted for instrument drift by multiplying by the drift factor. Each time a calibration is performed, the drift factor is reset to 1.0. The units of the area, A, are then adjusted to reflect absolute amount of analyte by multiplying by the sensitivity factor.

$$Adj = A * Sensitivity\ Factor * Drift\ Factor$$

The resultant adjusted area, Adj, of the standards are plotted against the known grams Analyte * 100 of the analyzed standards. The best-fit line, linear, quadratic, or cubic, is determined and taken as the calibration curve for the method. The default calibration curve has a slope of 1.0 and travels through the origin.



In general, the line that is to be selected is the line that yields the lowest RMS error. However, if none of the calibration standards are very low in analyte concentration, then linear fixed-at-origin should be selected. This should only be done if the samples of unknown analyte concentration do not fall in the range of very low analyte concentration.

If, however, the samples of unknown concentration mostly fall into the very low analyte concentration range, the 1/certified weighting should be selected. This type of weighting helps off set a natural bias to higher concentration standards during the least squares fitting process.

Adj is now taken through the calibration curve to yield grams analyte * 100.

$$\text{grams Analyte} * 100 = \text{Adjusted Area} * \text{Slope} + \text{Intercept}$$

This is then generally converted to a percentage to be reported. The calculation is performed by dividing the grams analyte * 100 by the mass of the sample in grams.

$$\% \text{ Analyte} = \frac{\text{grams Analyte} * 100}{\text{Sample Mass}} - \text{Atmospheric Blank}$$

The instrument is now ready to give accurate results over the calibrated range for each calibrated cell.

There is a bit of daily maintenance that must be performed to ensure instrument accuracy. At least once per day, preferably at least once every four hours, or in the event of a method change, the blank must be verified. If it is different than the pre-defined blank, it must be reset.

Calibration Definitions

1/Certified Weighting—A weighting that can be applied to the calibration data points that will counteract a bias for higher concentrations that comes naturally out of the curve fitting routines.

Adjusted Area (Aadj)—Adjusted Area = Area (A) times Correction Factor times Sensitivity Factor times Drift Factor. Area (A) equals Raw Area (Ar) minus Blank Area (Ab).

Analyte—The substance whose physical or chemical properties are measured and correlated, directly or indirectly, to the desired information.

Atmospheric Blank—In every encapsulated sample, there are both sample material and air (atmosphere). The amount of air trapped with the sample, atmospheric blank, is dependent upon the volume of sample (sample mass) and the physical state of the sample (pellet, liquid, powder, crystal, grain, etc.). After the combustion of the sample, the nitrogen from sample and atmosphere are presented to the detector and mass.

Blank—The signal obtained during an analysis that cannot be attributed to the sample. The blank is due primarily to Argon impurities in the oxygen. The blank should be determined before calibration or drift correction.

Blank Area (Ab)—The area under the peak obtained when analyzing blank analyses. Each method shall require a defined blank or it will be defaulted to zero.

Blank—The signal obtained during an analysis that cannot be attributed to the sample. The blank is due primarily to Argon impurities in the oxygen. The blank should be determined before calibration or drift correction.

Calibration Curve—A series of standard samples containing known concentrations of the analyte are analyzed. These standards should cover the range of interest and have a matrix composition as similar to the samples as possible. A blank sample must be analyzed and subtracted from each of the standard samples. The Adjusted Area, Aadj, is plotted along the X-axis versus the known concentration along the Y-axis for each of the analyzed standard samples. The curve that best fits the plotted points is the calibration curve.

Calibration Factor—The slope of the obtained calibration curve.

Drift Correction—The process of determining the drift factor.

RMS Error—(Root Mean Square Error) A method of quantifying dispersion or spread of data. It is used in the *Windows* software to determine which calibration curve is better. The lower the RMS error the better.

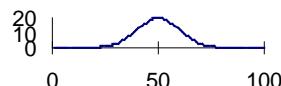
Drift Factor—A factor that is applied to the signal of an analyzed defined standard to adjust it to the expected signal; based on information extrapolated from the calibration curve. It is then used to adjust analyte signals to correct for instrument drift.

Linearization Table—A table containing peak heights and slopes. The purpose is to make minor adjustments to the signal to compensate for minor non-linearities in the IR cells.

Origin—The intersection of the X and Y axes. On the calibration curve, this is zero concentration and zero signal.

Mass—The quantity of matter in an object. In the *Windows* software mass is the equivalent of weight in the keypad software. Default Unit: gram.

Peak—When the analyte passes through the TC cell, there is a change in the voltage of the detector that is proportional to the amount of analyte in the cell. After the analyte is passed the IR cell detector voltage returns to normal. The region of this voltage change is the peak.



RMS Error—(Root Mean Square Error) A method of quantifying dispersion or spread of data. It is used in the *Windows* software to determine which calibration curve is better. The lower the RMS error, the better.

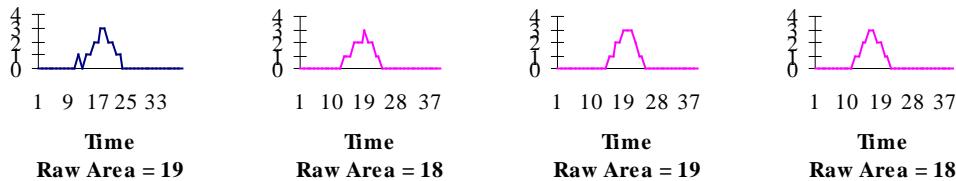
Sample—A determined mass of a substance of unknown analyte concentration. The analyte concentration will be determined by performing the analysis.

Sensitivity Factor—A multiplicative factor applied to the adjusted area (A_{adj}) for the purpose of adjusting the units and to give a calibration factor near 1.0.

Standard—A sample whose analyte concentration is accurately known.

Blank Analysis

Several blanks should be analyzed. The linearization table is applied to the peak during the analysis. The area under the peak is calculated and stored as a raw area (A_r).



If the four blanks displayed previously were selected in the software to calculate a blank, the result would be that the average of the four would be stored as the blank area (A_b).

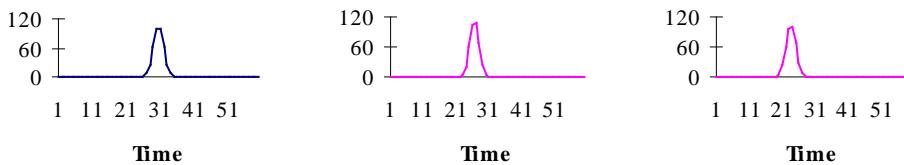
$$A_b = \frac{19+18+19+18}{4} - 18.5$$

The results for analyzed blanks will be calculated in the same manner as all other analyses. The result is displayed in percent. The blank is stored as an area. However, to avoid confusion, the blank that is listed on the print out and on the display is in percent. The concentration displayed is based on a 1 gram samples mass and the current calibration factor.

The blank area, A_b will be subtracted from every sample analyzed after it is set.

Standard Analysis

After the blank is defined, a calibration needs to be performed. At least three replicates of the same standard need to be analyzed in the same fashion as the blanks. The standard needs to be selected such that the analyte concentration is in the middle of the operating range. The linearization table is applied to the peak during the analysis.



The area under the peak is calculated and stored as a raw area, Ar . The current blank area, Ab , is subtracted from the raw area, Ar , of the standard to yield the Area, A .

$$A = Ar - Ab$$

The units of the area, A , are then adjusted to reflect absolute amount of analyte by multiplying by the sensitivity factor (different for each IR cell) and the calibration factor (1.0 is the default value).

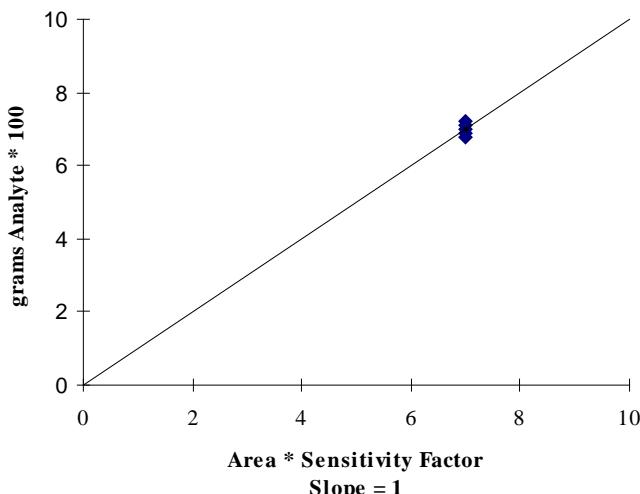
$$\text{grams Analyte} * 100 = A * \text{Sensitivity Factor} * \text{Calibration Factor}$$

The result is displayed generally as a percentage. This is calculated by dividing the absolute amount of analyte, A_2 , by the mass of the sample in grams and subtracting the atmospheric blank.

$$\% \text{ Analyte} = \frac{\text{grams Analyte} * 100}{\text{Sample Mass}} - \text{Atmospheric Blank}$$

The calibration factor is determined by comparing the % Analyte obtained by the analysis and the known % Analyte of the standard. A standard should be selected that has a known analyte concentration in the middle of the operating analyte concentration range. A ratio is taken of the known and observed analyte concentration. The resultant ratio is taken as the calibration factor. The calibration is then a line drawn from the origin having a slope equal to calibration factor.

$$\text{Calibration Factor} = \frac{\text{known \% Analyte in Standard}}{\text{Average \% Analyte in Standard obtained by Analysis}}$$



Now, samples of unknown analyte concentration may be analyzed. The process and order of events are the same as described before.

- NOTE →** The calibration should be adjusted when there is a substantial change in operating analyte concentration or if a standard fails to yield the known analyte concentration. Also, the blank must be performed before calibration and needs to be redefined anytime there is a change in method of analysis. Calibration and blank must be defined for each element analyzed or each cell used in the analysis.

Drift Factor

The drift factor is applied to the peak area before it is taken through the calibration curve, preserving the integrity of the calibration curve. The drift factor is intended to make minor corrections to the accuracy of the results. It is necessary to compensate for changes that cannot be attributed to blank or method changes.

The drift factor is determined by comparing Area obtained from the analysis of standard samples to the theoretical area calculated from the calibration curve. A ratio is taken of the two. The resultant ratio is taken as the drift factor.

$$\text{Drift Factor} = \frac{\text{Theoretical area, } A, \text{ calculated from calibration curve}}{\text{Observed area, } A, \text{ from analysis of standard samples}}$$

Comparator Level

An analysis that lasts excessively long causes an unnecessary delay, while an analysis that is not long enough can cause loss of significant data collection. Because not all samples melt in the same way, analyses should not be performed based on time alone.

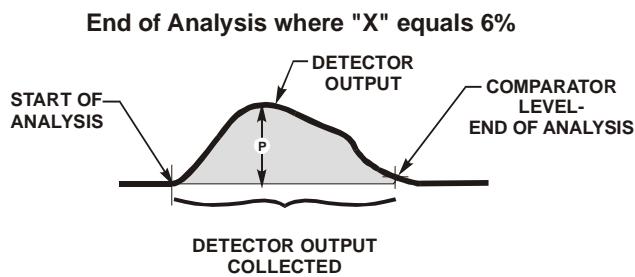
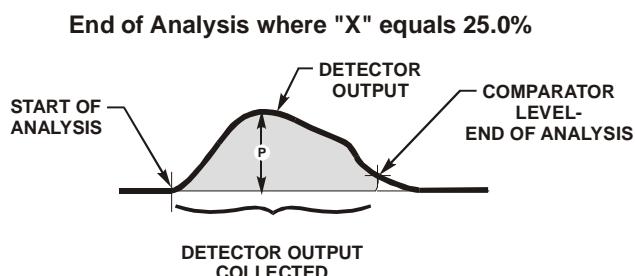
The length of each analysis is determined on an individual basis by the time-out and comparator level. An analysis ends when the time limit is reached and the A/D output of the detector, after passing its peak, is equal to the comparator level. This comparator level is a constant of five plus a percent of the peak:

$$\text{Method Comparator Level} = 5 + (X)(P).$$

Where P = detector A/D output peak and X = selected comparator level percentage.

During an analysis, the output of the detector, in the form of digital data, is collected and summed to arrive at the analysis result. If this data were plotted, it would reflect the "curve" of the detector output.

Shown in the following illustrations are two examples of the same detector output "curve" (buffer plot). The first example shows the amount of detector output collected during an analysis with a comparator level setting at 25% while the second example illustrates this at 6%.



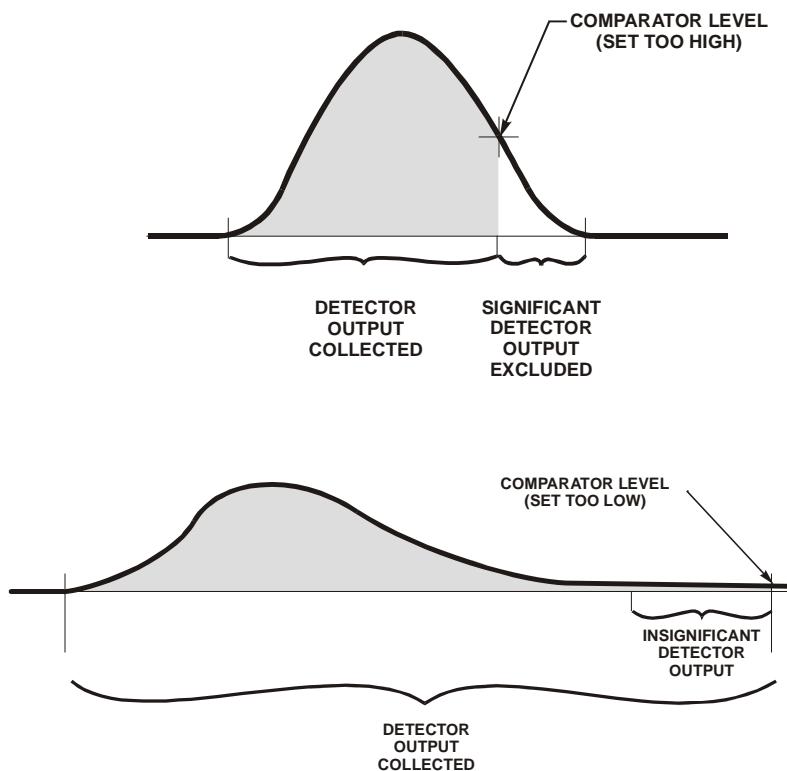
The following conclusions can be drawn from the examples:

- A high comparator level shortens analysis time.
- A low comparator level includes more sample gas, and, therefore, more analyte, into answer calculations.
- A comparator level that is too low, however, results in the inclusion of very low concentrations, which do not significantly affect the result (noise) but lengthen the analysis.

A comparator level of one percent usually provides optimum performance by allowing the collection of all significant output within a reasonable time.

Extremely low output peaks may need a larger comparator level to exclude insignificant output levels produced toward the end of analysis and to cut down on drift. The minimum time should be extended to match what would be considered a reasonable time length for the analysis of such samples. The combination of a high comparator level setting and an extended minimum analysis time ensures that all significant output is collected and analysis time lengths are consistent without being extensive.

Whenever the comparator level changes, check the system calibration since interaction can occur.



8 Diagnostics

The Diagnostics chapter explains how to monitor and check the operation of the instrument hardware, which can help determine if the instrument is operating properly. Use Diagnostics to check switches and solenoids and to monitor various system hardware parameters.

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Illustrations

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Ambient Monitor

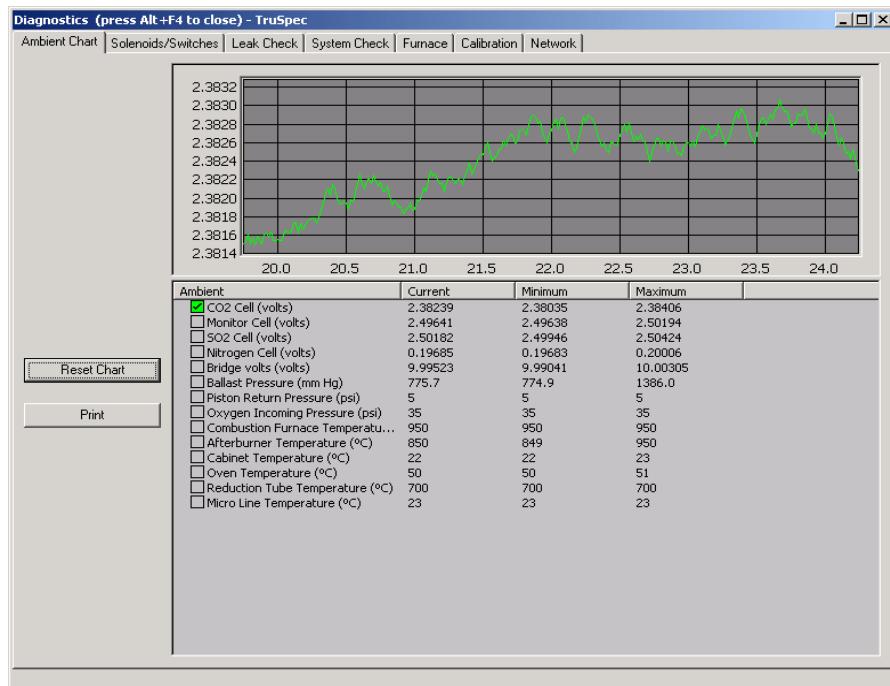
The Ambient Monitor permits the service technician or operator to monitor instrument parameters and determine their status. Ambient Chart provides system parameters on a chart and graph. The selected parameters are not selectable by the operator; they were selected by LECO as being the most critical to monitor.

Refer to Ambient Monitor Definitions, page 8–4, for information concerning the parameters and values displayed on the Ambient Chart screen.

- NOTE** → If the instrument has just been turned On, it will take a period of time for the system to stabilize.

Ambient Chart

1. Select Diagnostics and select Chart to display the Ambient Monitor Chart screen.
2. Check that all system parameter values fall within the Ambient Monitor Ranges, page 8–5. If any values are out of range, refer to the corresponding topic for additional information.



3. Select the checkbox to the left of the desired parameter to display the parameter value in the graph above the chart. More than one parameter can be displayed by holding down the Control Key and selecting the Parameter Checkbox. A yellow circle with an exclamation mark inside to the left of the checkbox indicates the parameter value is outside the desired range.
4. Click the right mouse button, with the mouse pointer inside the graph, to reset, restore, zoom in, zoom out, and set the graph range. The parameter value is displayed on the vertical axis and the time is displayed on the horizontal axis. The box in the lower left corner of the graph displays the hours since the instrument was turned on or the graph reset. The hours reset to 0 after 24.
5. Select Reset Chart to reset the parameter values and time on the chart and graph.
6. Select Print to print the parameter values on the system printer.

Ambient Monitor Definitions

Refer to page 8–5 for Ambient Monitor Ranges.

CO₂ Cell—The IR Cell output voltage in volts. A properly operating cell should have an output greater than 1.5 volts. There is no mechanical adjustment for output voltage. The output voltage is set by software.

H₂O Cell—The IR Cell output voltage in volts. A properly operating cell should have an output greater than 1.5 volts. There is no mechanical adjustment for output voltage. The output voltage is set by software.

SO₂ Cell—The IR Cell output voltage in volts. A properly operating cell should have an output greater than 1.5 volts. There is no mechanical adjustment for output voltage. The output voltage is set by software.

Nitrogen Cell—The TC Cell output voltage in volts. A properly operating cell should have an output greater than 0.0 volts. There is no mechanical adjustment for output voltage. The output voltage is set by software.

Bridge Volts—The output voltage of the TC cell bridge in volts. The bridge is a measurement device in the TC cell that develops an output signal based on the analyte concentration.

Oxygen Incoming Pressure—The incoming oxygen pressure measured by the instrument and set by the regulator at the oxygen tank. Pressure transducer P1 measures incoming oxygen pressure. The oxygen pressure is set to 35 psi.

Combustion Furnace Temperature—The temperature of the combustion furnace. Nominally this temperature should be set to 1100°C for the micro determinator. Range: Ambient to 1100°C. This temperature is measured by a thermocouple in the furnace.

Afterburner Temperature—The temperature of the afterburner or secondary side of the combustion furnace. Nominally, this temperature should be set to 850°C. Range: Ambient to 1050°C. This temperature is measured by a thermocouple in the afterburner or secondary furnace.

Cabinet Temperature—The ambient temperature inside the instrument as measured by a temperature transducer. This value is in degrees Celsius. Before analysis, the ambient temperature should be approximately 25°C or the ambient room temperature.

Oven Temperature—The temperature of the IR and TC cell oven compartment. This temperature should be at 60°C for the micro determinator.

Reduction (Catalyst) Tube Temperature—The temperature of the Catalyst Heater. This temperature is measured by a thermocouple in the catalyst heater and not adjustable by the operator. The temperature of the catalyst heater is 700°C

Micro Line Temperature—The temperature of the heated manifold block. The nominal temperature is 110°C.

Ambient Monitor Ranges

A yellow exclamation point will appear next to the parameter name on the ambient monitor screen if the parameter value is out of minimum or maximum range.

- NOTE** → The instrument must be on for at least 2 hours and the oxygen flow set to Low before checking the following parameter values.

Parameter	Minimum	Maximum
CO ₂ Cell	0.0 volts	5.0 volts
H ₂ O Cell	0.0 volts	5.0 volts
SO ₂ Cell	0.0 volts	5.0 volts
Nitrogen	0.0 volts	1.5 volts
Bridge Volts	5.0 volts	11 volts
Pneumatic Incoming Pressure	0 psi	42 psi
Combustion Furnace Temperature	900°C	1100°C
Afterburner Temperature	Ambient	1050°C
Cabinet Temperature	Ambient	50°C
Oven Temperature	55°C	65°C
Reduction Tube Temperature	690°C	710°C
Micro Line Temperature	105°	115°

Calibrations

Calibrations permit the service technician or operator to set the barometric pressure, combustion flow calibration, and perform a backup calibration using the calibration disk supplied with the instrument.

Set (Barometric) Pressure

Set Pressure permits the service technician to calibrate the barometric transducer located in the instrument.

Calibration is necessary for proper analysis results. This procedure is performed during initial testing and should not require recalibration when the instrument is installed at the operating location. For more information about barometric pressure, refer to the [Barometric Pressure](#), page 7-7.

To set the barometric pressure, refer to [Calibrating Barometric Pressure for TC Cell](#), page 4-33.

Set Bridge

Set Bridge sets the gain of the TC Cell.

NOTE → The TC Cell gain has been set during the manufacturing process. It is not necessary to reset the gain unless it has been serviced or replaced.

1. Select Auto Set Bridge to automatically set the gain of the TC Cell. The gain factor will appear in the edit box to the left of the set bridge button.
2. To manually set the gain, enter the gain factor in the edit box and select Set Bridge. The gain factor must be between 0 and 255. This can be used for troubleshooting or servicing the instrument.

Furnace Calibration

Sets temperature calibration for the Reduction Tube (Catalyst Heater), Combustion Furnace, and Afterburner Furnace.

NOTE → The reduction heater and furnaces were calibrated during the manufacturing process. It is not necessary to recalibrate them unless they have been serviced or replaced.

1. Remove the reduction heater or furnace tube and insert a calibrated thermocouple into the center of the heating element. Refer to the procedure outlined in [Packing the Reduction Heater Tube](#), page 6-26, or [Removing and Replacing the Combustion Tube](#), page 6-30.
2. Allow the temperature to stabilize and enter the value in the temperature edit box.
3. Select Set Offset to calibrate the reduction heater or furnace.
4. Remove the thermocouple and reinstall the reduction or combustion tube.

Backup (Hardware) Calibration

Backup Calibration permits the operator to save hardware calibration parameter values in a designated file on the system hard drive. This file can be accessed at a later time to restore hardware calibration values that may have been lost or changed. It is not necessary to backup the calibration values to save them; the instrument will automatically save them in a system file. It is necessary to save them in a backup file if you think you will ever need to restore them to earlier defined hardware calibration values.

Backup Calibration saves the following parameter values:

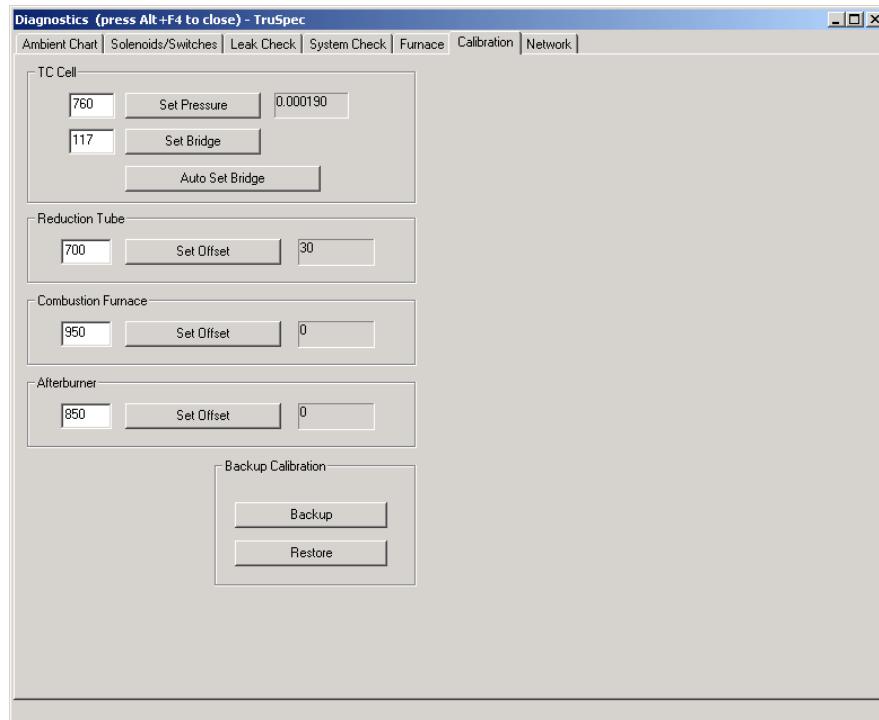
- Barometric Pressure Calibration
- Combustion Flow Calibration
- TC Bridge Value
- Furnace Calibrations
- IR Cell Reference and Saturation Values

Perform this procedure if you feel it will be necessary to restore calibration values that were lost.

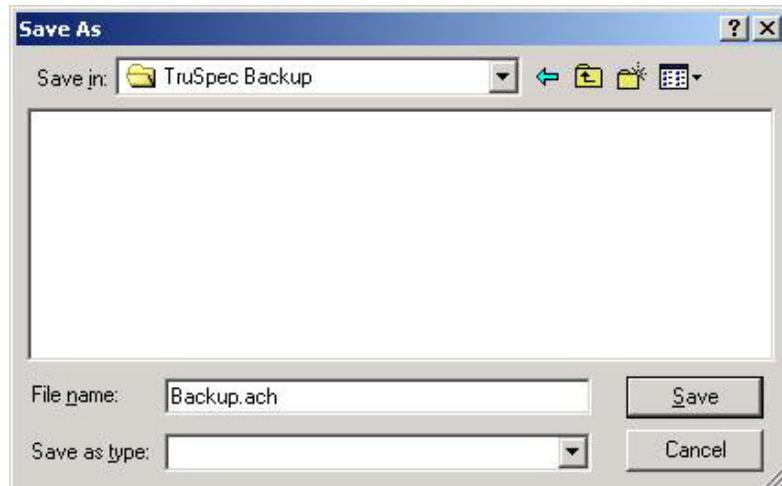
It is not necessary to perform this procedure to save the calibration values. The instrument automatically does this in a system file.

Backup Calibration Values

1. Select Diagnostics and select Calibration. The Hardware Calibration screen will appear.



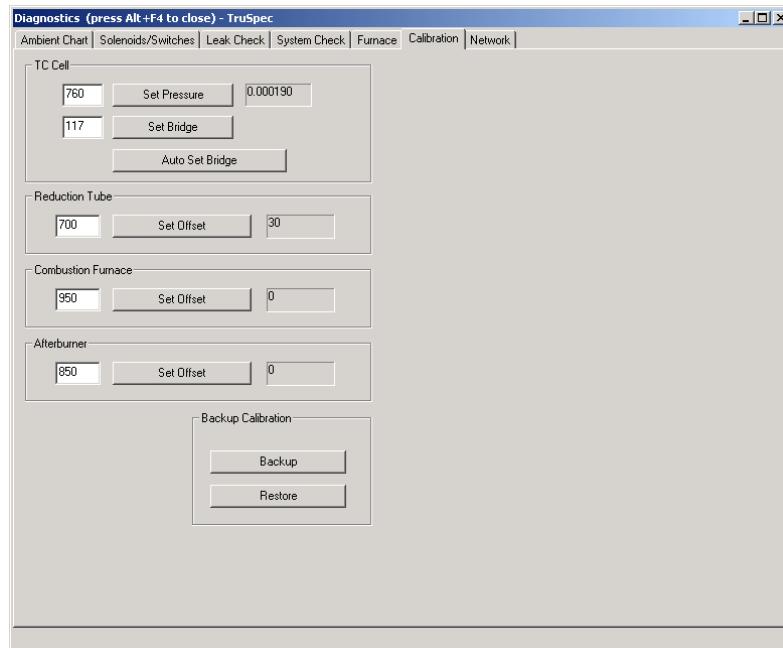
2. Select Backup to create a backup file of the hardware calibration parameter values. The file Save As dialog box will appear.



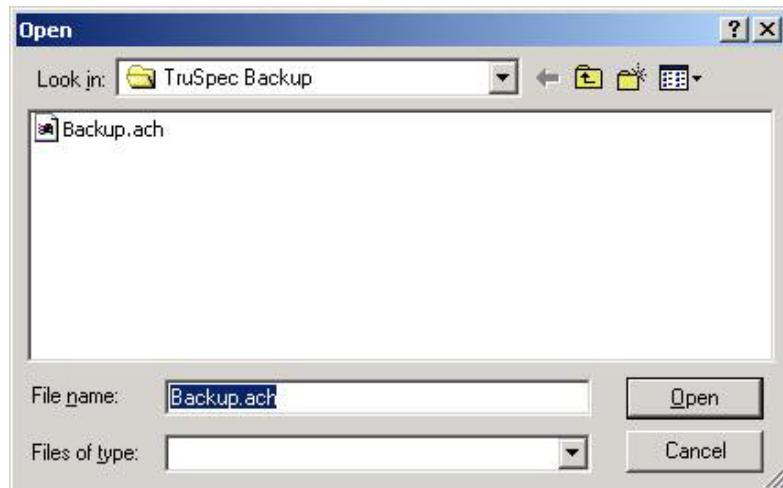
3. Enter the file name and folder location in the dialog box.
4. Select Save to save the backup file.

Restore Calibration Values

1. Select Diagnostics and select Calibration. The Hardware Calibration screen will appear.



2. Select Restore to load the hardware calibration values that have been saved in a backup file. The file open dialog box will appear.



3. Select the folder and backup file from the dialog box.
4. Select Open to load the calibration values from the selected backup file.

Network Diagnostics

The electronic design of the instrument is modular. It consists of a main controller, similar to a host computer, and peripheral electronic assemblies, which are controlled from the main controller. During operation, all peripheral assemblies communicate with the main controller over a common electronic bus. Because of this arrangement, information can be displayed and assemblies controlled from the network screen.

From the Network screen, the type of hardware installed can be identified, the version of firmware identified, the operational status of the peripheral devices can be determined, the network can be reset, a network device can be reset, and the firmware can be upgraded.

The spreadsheet in the upper right area of the screen lists the device, identification, classification, instance used, serial number, version number of the application software, checksum of the applications software, and the version of the network software. Refer to [Network Definitions](#), page 8-11.

1. Select the Diagnostics tab.
2. Select Network.
3. The Network screen will appear.

A screenshot of a computer window titled "Diagnostics (press Alt+F4 to close)". The window has tabs at the top: Ambient Chart, Solenoids/Switches, Leak Check, System Check, Furnace, Calibration, and Network. The Network tab is selected. Below the tabs is a table with the following data:

Poll Devices	Device	MAC-Id	Class	Instance	Serial	Version	Checksum	NI Version	Hardware Id	FPGA Version
IR*	2	20	0	000003FEEADD	1.00	3581	1.0	00	FF	
TC	3	21	0	0000034EADAE	1.10	3814	1.0	00	FF	
Oven	4	A2	0	000047165695	1.00	2576	1.0	00	FF	
Dual Heater V0	5	A6	0	000043765224	1.00	2342	1.0	00	FF	
IE Cooler	7	A5	0	000073569865	1.00	4565	1.0	00	FF	
Reset Board	8	B5	0	000021434465	1.00	2341	1.0	00	FF	
Pneumatics	9	B3	0	000053767989	1.00	5646	1.0	00	FF	
Sulfur Furnace	6	A9	0	000043765224	1.00	2342	1.0	00	FF	

At the bottom left of the window is a "Print" button.

Poll Devices

Select Poll Devices to send a signal over the network to determine what is connected to the network. Network hardware should appear under devices indicating they are functioning and signing on to the network.

Reset Network

Select Reset Network to restart the network software. If something or some operation causes an error, this restart may correct it.

Upgrade a Device

1. To upgrade a device with a new version of application firmware, select the Device to upgrade. Then select Download to download the new firmware.
2. Select Reset Board to restart firmware application program on the circuit board.

Network Definitions

Device—The name of the electronic assembly connected to the network. Example: TC Cell.

MAC-id—The network ID number assigned to the electronic assembly connected to the network. This number is assigned at power up and can vary.

Class—The type number of the electronic assembly signed on to the network. Example: 21 is the class number assigned to the TC Cell.

Instance—A unique number assigned to an electronic assembly. If two or more of the same type electronic assemblies are installed in the instrument, this number will be different for each assembly and is used by the controller to differentiate one from the other.

Serial—The hardware ID number assigned to the electronic assembly. This number is assigned during manufacturing and is unique to each electronic assembly. The serial number is stored on the circuit board in a PROM.

Version—The version number of the application software located on the electronic assembly. This software can be upgraded from the network procedure.

Checksum—A number unique to the application software to verify if the software was properly installed. This will be a checksum number supplied with any software upgrades. Make sure that the number appearing in the checksum cell is the same as the number supplied with the software upgrade.

NI Version—The version number of the network control software installed in the electronic assembly. This software is located in a PROM and cannot be upgraded from the network procedure.

Hardware ID—Additional circuit board hardware identification.

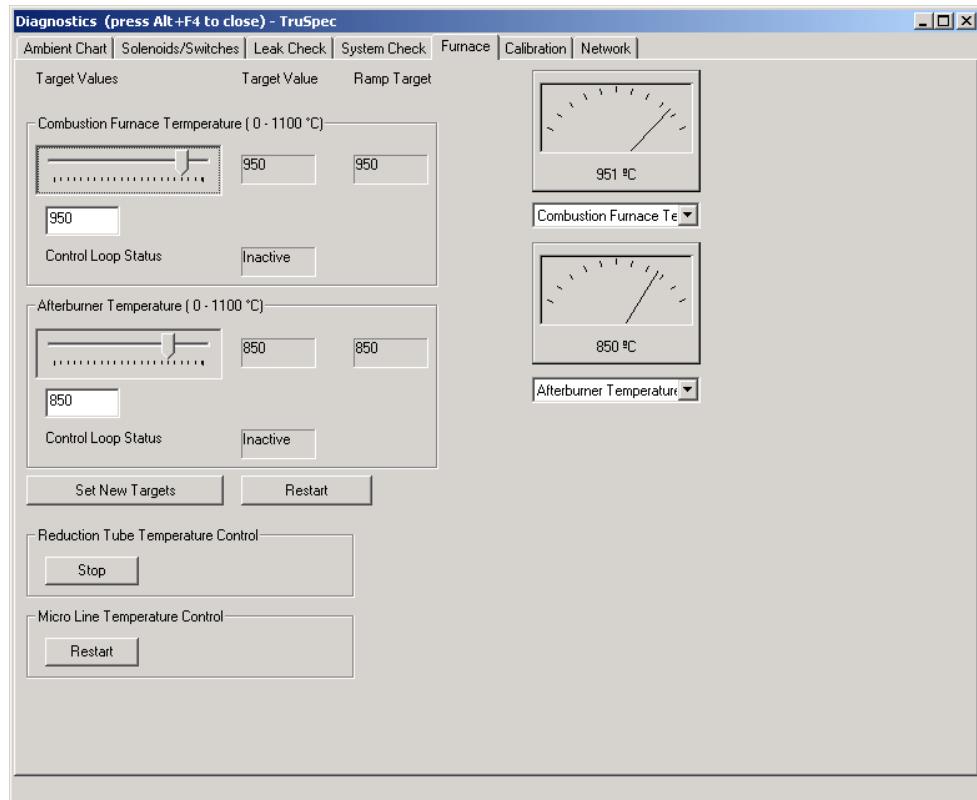
FPGA Version—The version of the FPGA (Field Programmable Gate Array) software.

Furnace Diagnostics

The Furnace diagnostics screen is used to test the furnace and verify proper operation. The meters on the right side of the screen can be used to monitor Furnace Temperature.

When testing the furnace, set the temperature and observe the target value. The furnace should ramp to the set value and remain there. Refer to [Furnace Diagnostics Definitions](#), page 8-13.

Select Diagnostics and select Furnace. The Furnace diagnostics screen will appear.



Furnace Temperature Control

The Combustion Temperature and Afterburner Temperature dialog boxes permit the operator to set the furnace temperatures for service and Maintenance.



After exiting diagnostics, any temperatures that were changed will revert back to their previous settings.

Combustion Furnace and Afterburner Temperature Control

1. Select the temperature edit box, or move the slider and enter the desired furnace temperature.
2. Select Set New Targets to set the furnace temperature. The furnace will increase or decrease in temperature to the set temperature.



LECO does not recommend using the stop button to set the furnace to ambient. This disables electronic control of the furnace. Instead, set the target temperate below ambient and select Set New Targets.

3. Select Stop to disable control of the furnace temperature. The temperature will decrease to ambient.

Reduction Tube Temperature Control

The reduction tube temperature control dialog box is used to turn the reduction heater off or on. When control is turned On, the reduction tube temperature is automatically set to 700°C.

The reduction tube heater is also referred to as the catalyst heater.

1. Select Stop to turn Off temperature control of the reduction tube heater.
2. Select Restart to turn On temperature control of the reduction tube heater.

Micro Line Temperature Control

The micro line temperature control dialog box is used to turn the micro line heater off or on. When control is turned on the micro line heater temperature is automatically set to 110°C.

The micro line heater is used to heat the combustion gas as it leaves the combustion furnace.

This setting is only for the TruSpec® Micro.

1. Select Stop to turn Off temperature control of the micro line heater.
2. Select Restart to turn On temperature control of the micro line heater.

Furnace Diagnostics Definitions

Target Value—The temperature that the furnace will ramp to. This can be higher or lower than the current temperature. This value is set by the slider and appears in the window below target value.

Ramp Target—The current temperature of the furnace. The ramp target temperature will change at the furnace temperature increases or decreases.

Leak Check

NOTE → Do not perform a leak check until the furnace temperature has stabilized.

This procedure automatically checks the entire combustion (oxygen) and measurement (helium) system of the instrument for a gas leak.

During a leak check, the system is pressurized above current system furnace pressure and sealed. It's then permitted to equilibrate. For the next 60 seconds, the system pressure is measured. If the pressure does not fall below 5 mm Hg of the pressurized value or rise above 2.5 mmHg of the pressurized value, the leak check will pass. If the pressure changes more, the leak check fails.

If pressure has increased, a solenoid valve is not operating properly or the catalyst heater temperature has not stabilized. If pressure has decreased, gas could be leaking out of the system.

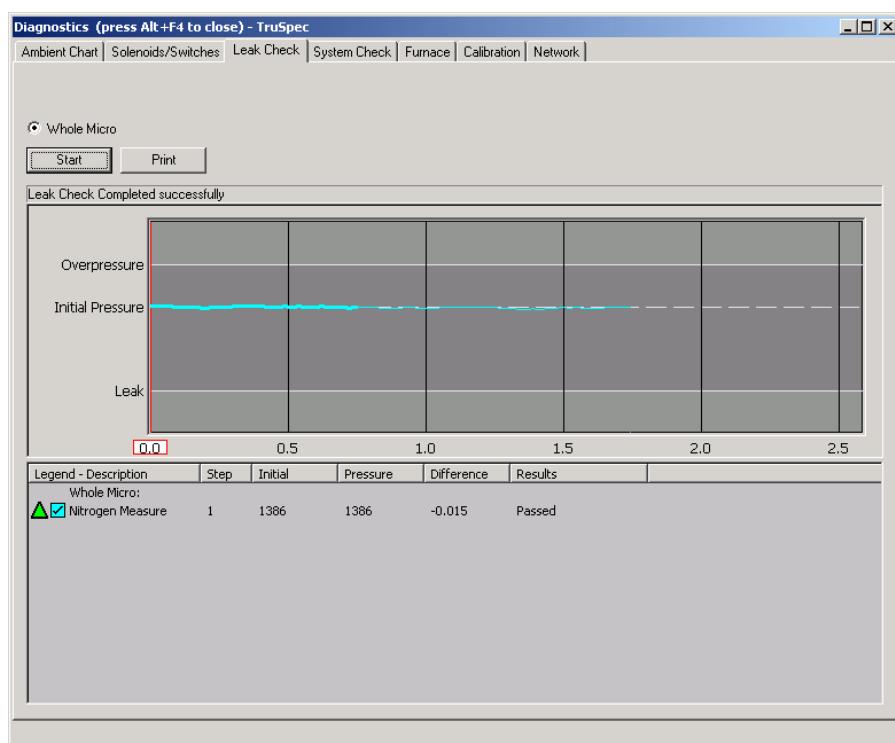
If the system leaks, "Leak Check Failed" appears in the leak check status bar. If the system does not leak, "Leak Check Passed" appears in the status bar.

Let the instrument warm up for at least for 30 minutes before performing a leak check. A Leak check should be performed at the start of each day.

Performing a Leak Check

NOTES →

- Refer to page 8–16 for the Combustion System Leak Check—TruSpec Micro.
 - Refer to [Leak Check Definitions](#), page 8–15, for additional information.
1. Select Diagnostics and then select Leak Check. The Leak Check screen will appear.



2. Select the Whole Micro button in the upper left of the screen to select the micro leak check procedure.
3. Select Start to perform a leak check. System pressure is monitored in the chart at the middle of the screen.
4. Select Stop to abort a leak check in progress.
5. Select Print to print the results of a completed leak check on the system printer.

Leak Check Definitions

Whole Micro—Select this button to pressurize and leak check the entire *TruSpec* Micro combustion system. The *TruSpec* Microanalysis Kit must be installed for this selection to appear.

Initial Pressure (graph)—The system pressure before the leak check is started. The system is pressurized to this value.

Overpressure (graph)—Overpressure is approximately 2.5 mmHg above initial pressure. If the pressure rises above this value the leak check will fail.

Leak (graph)—Leak pressure is approximately 5 mmHg below initial pressure. If the pressure falls below this value, the leak check will fail.

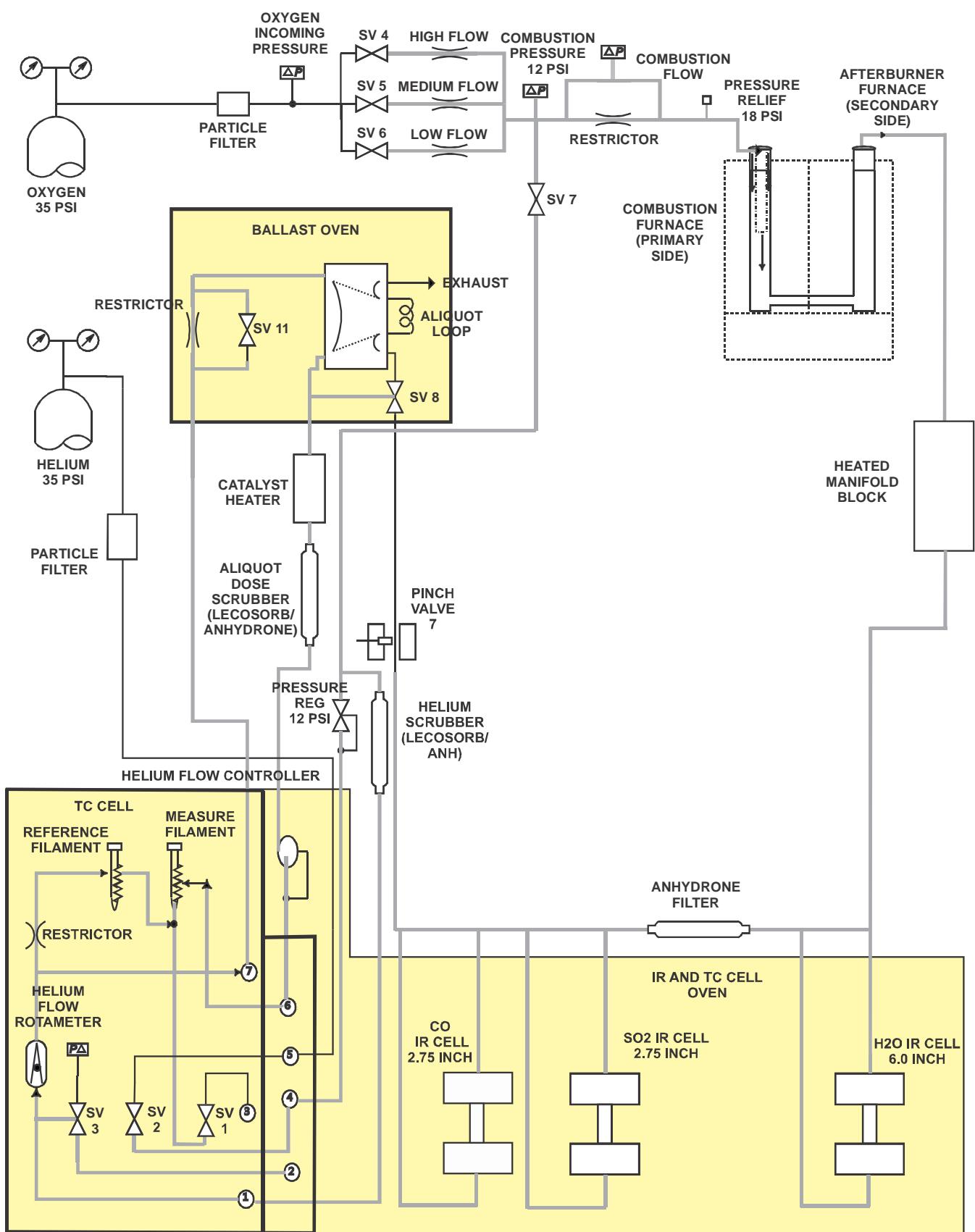


Figure 8-1
Combustion System Leak Check—TruSpec Micro

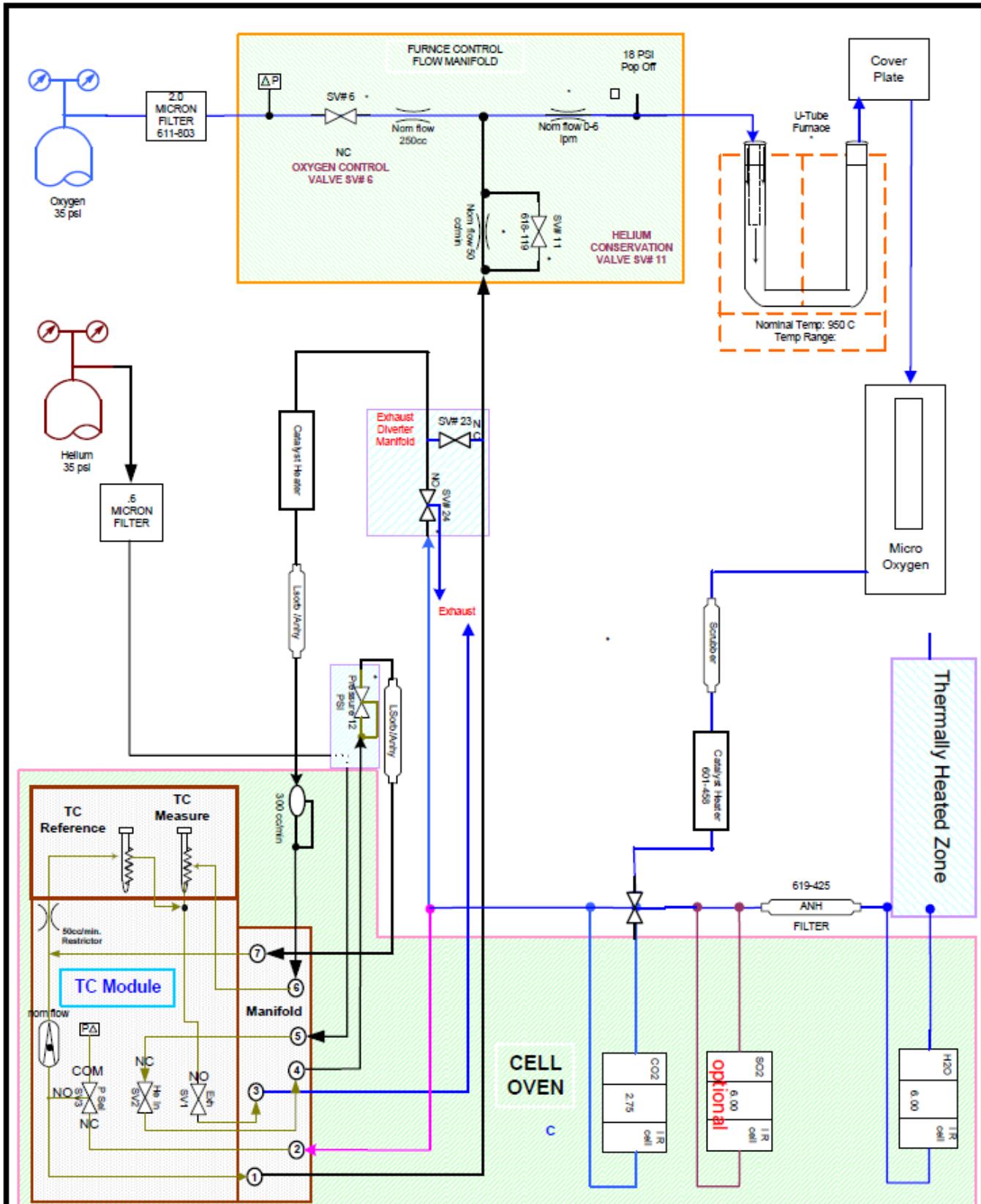


Figure 8-2
CHNSO Flow Diagram

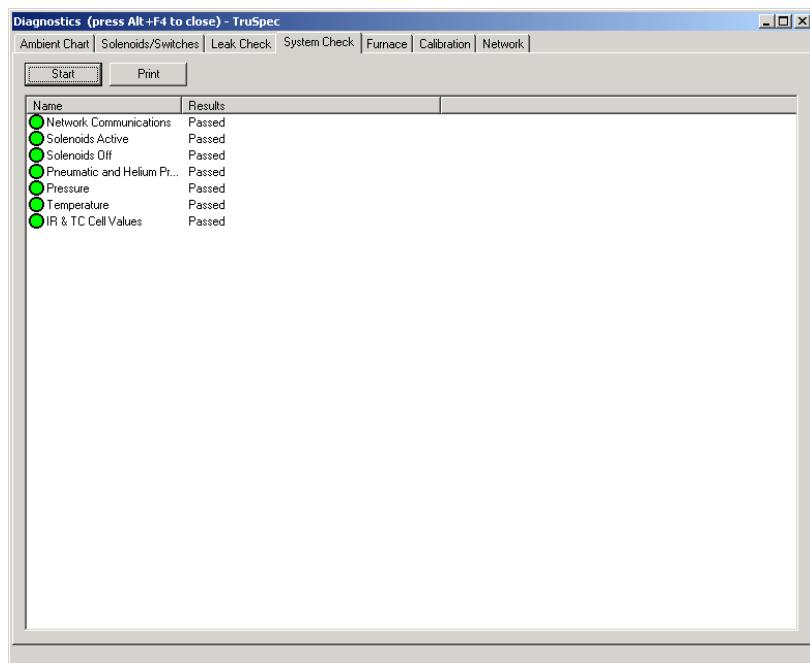
System Check

System check is a quick way to determine if major systems in the instrument are operating properly. All systems should have a green indicator beside them before the instrument is used for analysis.

The results of system check will be listed in the results column to the right of the item checked. If any of the system checks fail, the reason will be listed in the results column.

If a system fails system check, it will be necessary to correct the failure before analysis. Refer to [System Check Definitions](#), page 8-19.

1. Select Diagnostics and then select System Check. The System Check screen will appear.



2. Select Start to system check and test the systems listed on the screen.
3. The results of system check will be displayed to the right of the system being checked under the results column. An X inside the circle to the left of the system also indicates that the system checked failed.
4. Select Print to print the results of the system check on the system printer.

System Check Definitions

Network Communications—Communications between all electronic assemblies are checked and monitored. If any device on the network fails to communicate this system check will fail. Refer to [Network Diagnostics](#), page 8–10 for more information.

Solenoid Active—During this check each solenoid valve is activated and monitored. If any solenoid valve fails to activate system check will fail. Refer to [Solenoids and Switches](#), page 8–20, to check each solenoid valve individually.

Solenoids Off—During this check each solenoid valve is deactivated and monitored. If any solenoid valve fails to deactivate system check will fail. Refer to [Solenoids and Switches](#), page 8–20 to check each solenoid valves individually.

Pneumatic and Helium Pressure—Checks the incoming pneumatic and helium pressures to determine if they have been turned On and set to the proper value. If this check fails, check the pneumatic and helium gas tanks to determine if the gas has been turned On and the regulator properly set. If any pressure falls outside the range listed as follows, the test will fail.

- Pneumatic Pressure Range—38 to 42 psi.
- Helium Pressure Range—10 to 13.1 psi.

Pressure—Checks the combustion, incoming oxygen, and TC ballast pressures for their proper values. If any pressure falls outside the range listed as follows, the test will fail.

- Combustion Pressure Range—0 to 2 psi.
- Incoming Oxygen Pressure Range—30 to 40 psi.
- TC Ballast Pressure Range—700 to 780 mmHg.

Temperature—Checks the temperature of all heaters to determine if they are properly set and operating. If any temperature falls outside the range listed as follows, the test will fail.

- Oven Heater Temperature Range—5°C to 65°C.
- Combustion Furnace, Afterburner Furnace, Reduction Heater Temperature Range— \pm 10% of setpoint.
- Oven Temperature Range—setpoint to + 50°C.

Oxygen Low Flow—Checks oxygen low flow. If any pressure falls outside the range listed as follows, the test will fail.

- Low Flow Range—0.19 to 0.41 lpm.

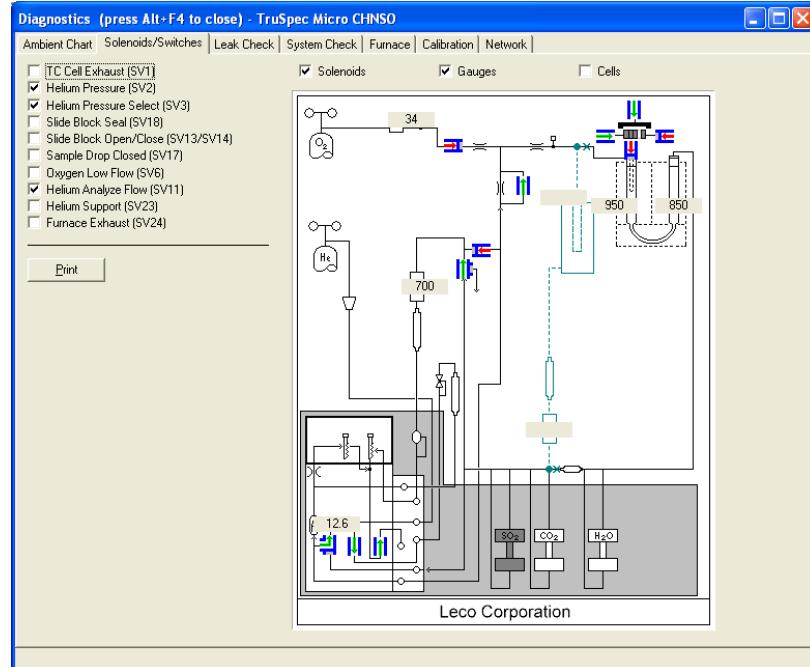
IR and TC Cell Values—Checks the IR and TC cell output voltages to determine if they are in the proper range. Refer to [Ambient Monitor Definitions](#), page 8–4, for more information. If any voltage falls outside the range listed as follows, the test will fail.

- IR Cell Output Voltage Range—1.0 to 4.8 volts
- TC Cell Output Voltage Range—0.1 to 1.5 volts

Solenoids and Switches

Solenoids and Switches permit the service engineer or operator to individually activate and deactivate each of the solenoid valves. This is a diagnostic test to determine the condition of the valve and its operational result. As an example, the slide block can be moved to determine its condition by toggling the Slide Block solenoid valve. To determine what each valve may affect, refer to the [TruSpec Micro Measurement Flow Diagram](#), page 7–4.

1. Select Diagnostics and select Solenoids and Switches. The Solenoids and Switches screen will appear.



2. Select the Checkbox next to the desired solenoid valve or switch to activate or deactivate it. A check mark in the box indicates that it is activated.
3. Check Solenoids to highlight and locate the solenoid valves on the flow diagram.
4. Check Gauges to locate the system pressure gauges and display their current pressure reading on the flow diagram.
5. Check Cells to locate the IR and TC cells and display their current cell voltage on the flow diagram.

9 Service

The Service chapter contains common service procedures that may correct operational problems with the instrument. The procedures included in this chapter may require disabling power to the instrument and should be performed only by trained personnel. If you are still experiencing difficulties after referencing the service information, please contact the LECO Service Department at 269-982-5497 for assistance.

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Illustrations

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Installing LECO Software

The following section explains the required settings, as follows, and in Software Installation Procedure, page 9–7, for LECO software. Additional information can be found in [Configuring the Ethernet Adapter](#), page 9–12, [Configuring Firewall Settings](#), page 9–19, and [Registering Software](#), page 9–23.

Required Settings for LECO Software

Operating System (OS) Requirements

The following table explains the minimum settings required for LECO software. LECO recommends that the system always be updated to correspond with the latest service packs available at www.microsoft.com.

Microsoft® Windows® OS	Minimum Requirements
7 (32-bit or 64-bit, 64-bit preferred)	None
Vista (32-bit)	None
XP (32-bit)	SP2
2000 (32-bit)	*SP4; **URP1; ***IE6

*SP=Service Pack; **URP=Update Rollup; ***IE=Internet Explorer

OS User Permission Requirements

The following table shows the minimum permissions that a user must have in the *Microsoft Windows* OS in order to perform certain tasks in the software. Refer to User Permissions.

Task	Minimum Permission
Using Software	Standard User
Installing Software	Administrator
Upgrading Software	Administrator
Setting up Users	Administrator
LECO Service	Administrator

Data File Permissions

To use LECO software, read-write access is required for all the data files. The proper permissions are automatically set up during the software installation; however, if these permissions are ever changed, file access errors can occur. The following table shows the data folders that require read-write permissions.

Microsoft Windows OS	Data Folder (including all subfolders/files) (Use the appropriate drive letter, typically C.)
7, 64-bit	ProgramData\LECO (hidden OS folder)
7, 32-bit	ProgramData\LECO (hidden OS folder)
Vista	ProgramData\LECO (hidden OS folder)
XP	C:\Documents and Settings\All Users\Application Data\LECO
2000	C:\Documents and Settings\All Users\Application Data\LECO

Antivirus Software

LECO recommends that antivirus checking be turned Off for the files listed in the following table to avoid interference with data collection or storage.

Microsoft Windows OS	Data Folder (including all subfolders/files) (Use the appropriate drive letter, typically C.)
7, 64-bit	ProgramData\LECO (hidden OS folder)
7, 32-bit	ProgramData\LECO (hidden OS folder)
Vista	ProgramData\LECO (hidden OS folder)
XP	C:\Documents and Settings\All Users\Application Data\LECO
2000	C:\Documents and Settings\All Users\Application Data\LECO

Control Panel Settings

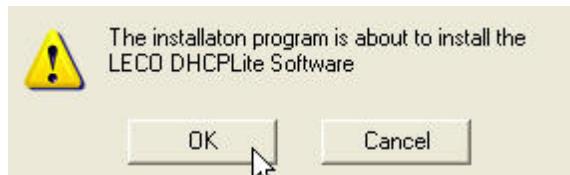
Control Panel Item		Required Setting
Power Options	Power Schemes	Always On
	Turn Off Hard Disks	Never
User Accounts	Use Fast User Switching	If Fast User Switching is active (Off by default on PCs from LECO), close the LECO software in one account before switching to a different account and trying to run it there.

Software Installation Procedure

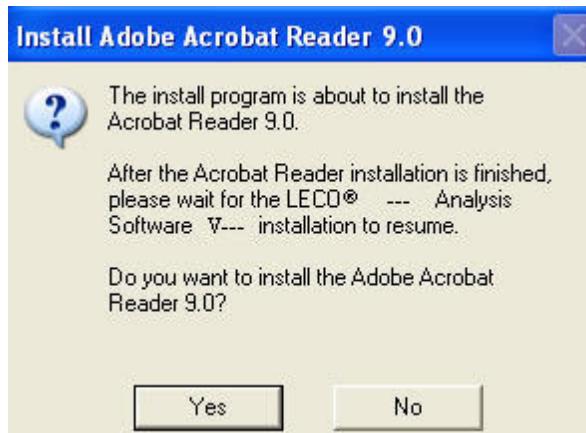
NOTES →

- The software must be started at least once on the administrative level as the software must be able to access and modify the registry.
- Do not install the Copy Protection Key until after the software has been installed.

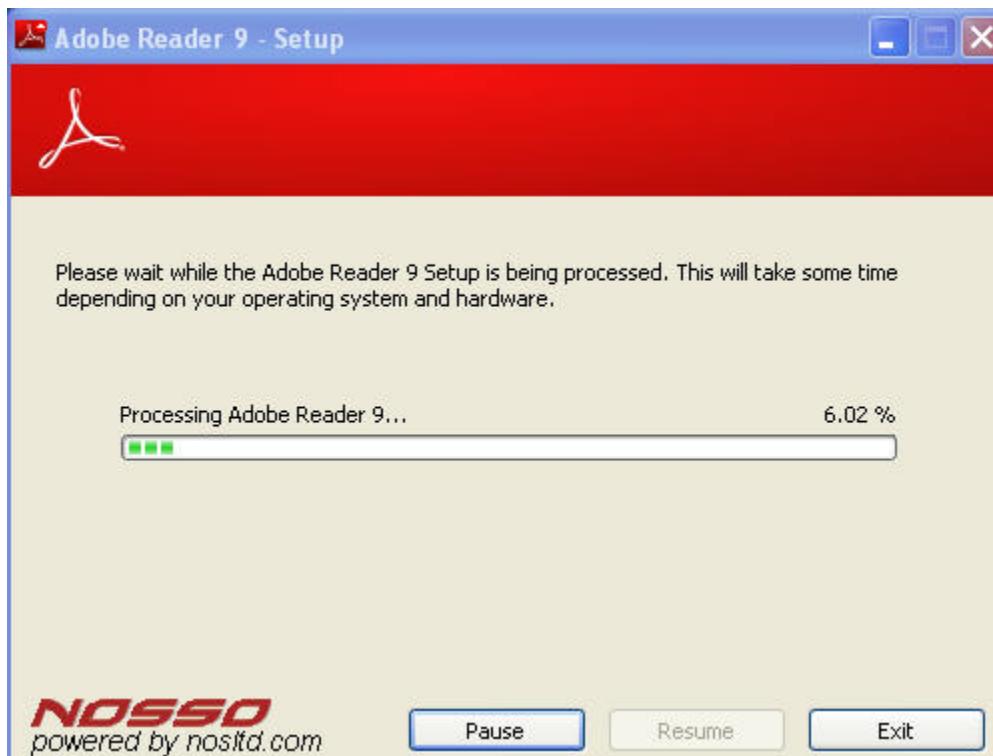
1. Verify that the instrument is turned Off.
2. Turn On the computer tower.
3. Install the communications cable (typically Ethernet or USB) as appropriate for the instrument.
4. For an Ethernet connection, configure the Ethernet adapter. Refer to [Configuring the Ethernet Adapter](#), page 9–12.
5. Log in to the operating system as administrator.
6. Insert the software installation CD-ROM into the CD-ROM disk drive (typically D).
7. Install the LECO DHCPLite software by selecting OK when the following message appears. (If the LECO DHCPLite software is already installed or not applicable, this message will not appear.)



8. If a version of Adobe® Reader® is already installed, refer to step 14. If *Adobe Reader* is not installed, the following dialog box will appear.



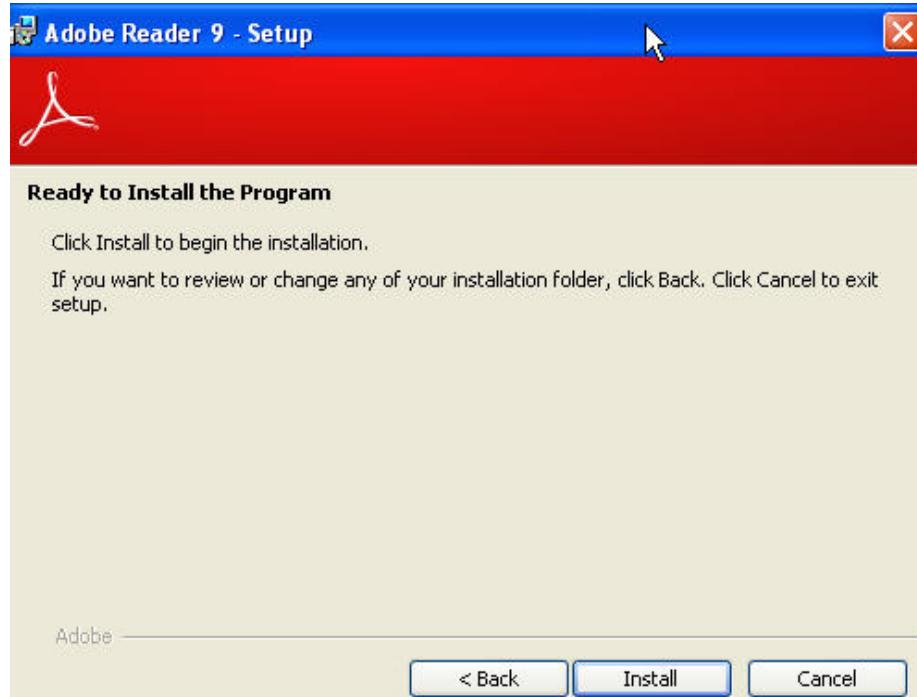
9. Select Yes. The following message box will appear to indicate *Adobe Reader* is preparing for installation.



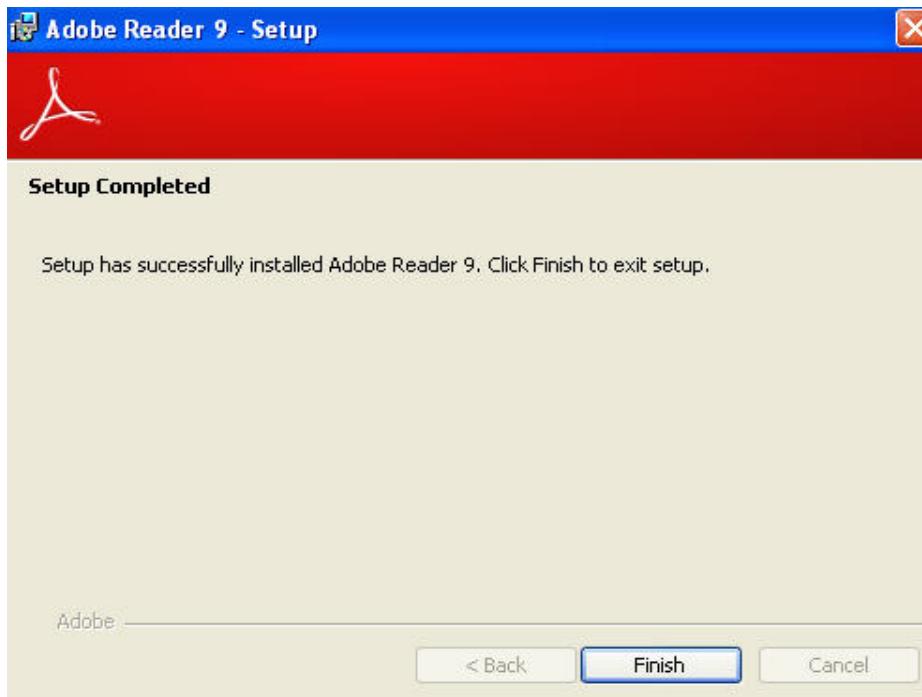
10. Determine the folder location for *Adobe Reader*. Select Next for the default location, or select Browse, select a different location, and then select Next.



11. When the "Ready to Install Program" dialog box appears, select Install.

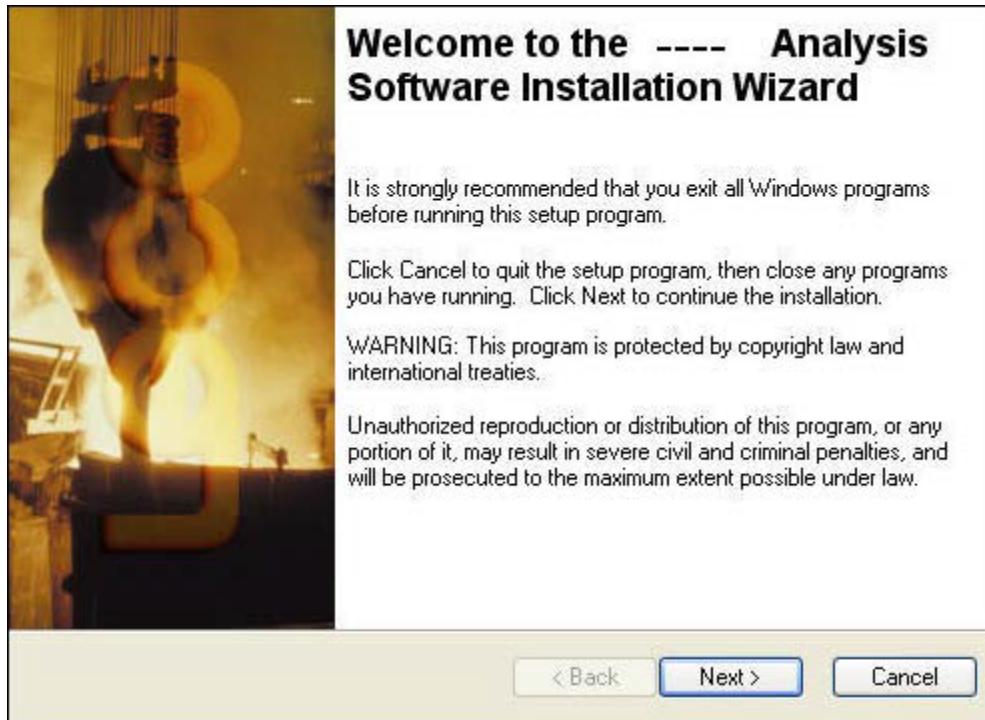


12. When the "Setup Completed" dialog box appears, select Finish.

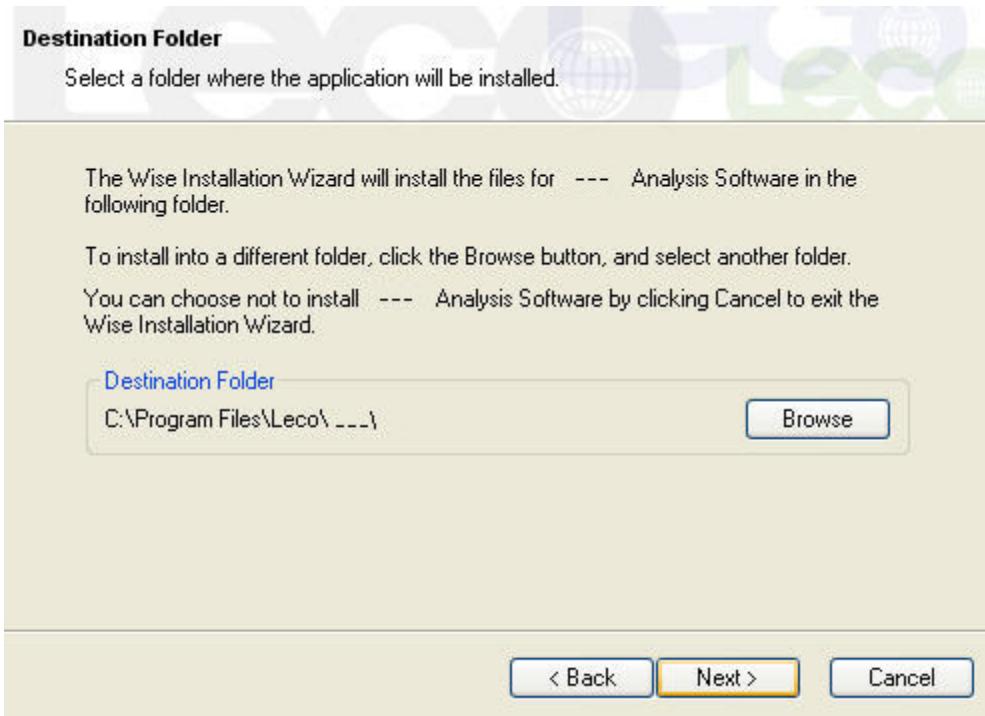


13. If the instrument software Welcome dialog box does not appear:
- Select the Start button in the lower left-hand corner.
 - Select Run. The Run dialog box is displayed.
 - Enter D:\Setup.exe and then select OK. (The letter D indicates the location of the CD-Rom drive. Typically, this drive is D, but the letter that is entered should correspond with the CD-ROM drive on the computer's hard drive.)

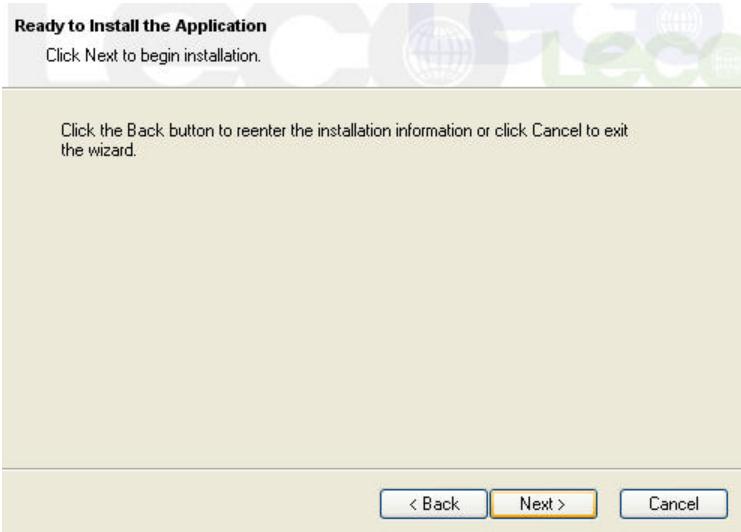
14. At the instrument software Welcome dialog box, select Next.



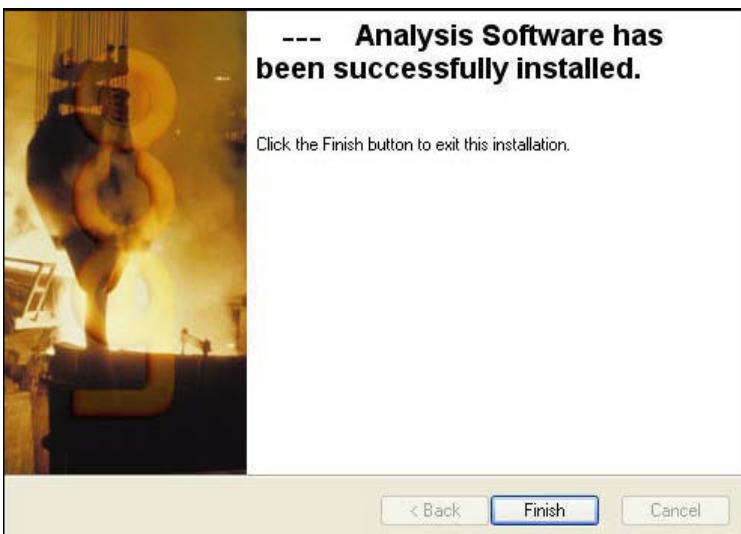
15. Determine the folder location for the software. Select Next for the default location, or select Browse, select a different location, and then select Next.



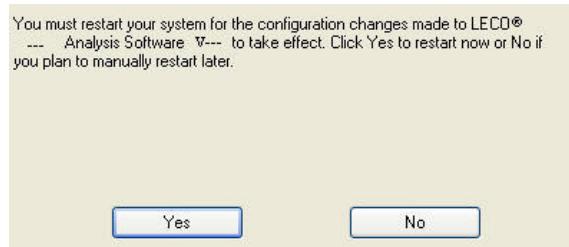
16. Select Next to install the software.



17. Once the software has installed successfully, select Finish. The icon for the instrument software will appear on the desktop.



18. After installing the software, it may be necessary to restart the system. If the following dialog box displays, select Yes to immediately restart the system.



19. Turn On the instrument.
20. Turn On the gas supplies.
21. Double-click the desktop icon for the instrument software to start the software.
If the Edit Registration dialog box appears, refer to [Registering Software](#), page 9-23.

Configuring the Ethernet Adapter

The following procedure is necessary for the proper operation of the software with a Copy Protection Key and applies for computer systems that are not supplied by LECO. For computers supplied by LECO, this configuration has already been completed.

- NOTE** → It is required that PCs used for running LECO applications be configured with a separate Ethernet adapter dedicated for communications with LECO instrumentation. (Connection to a network would require a second Ethernet port.)

Windows 7

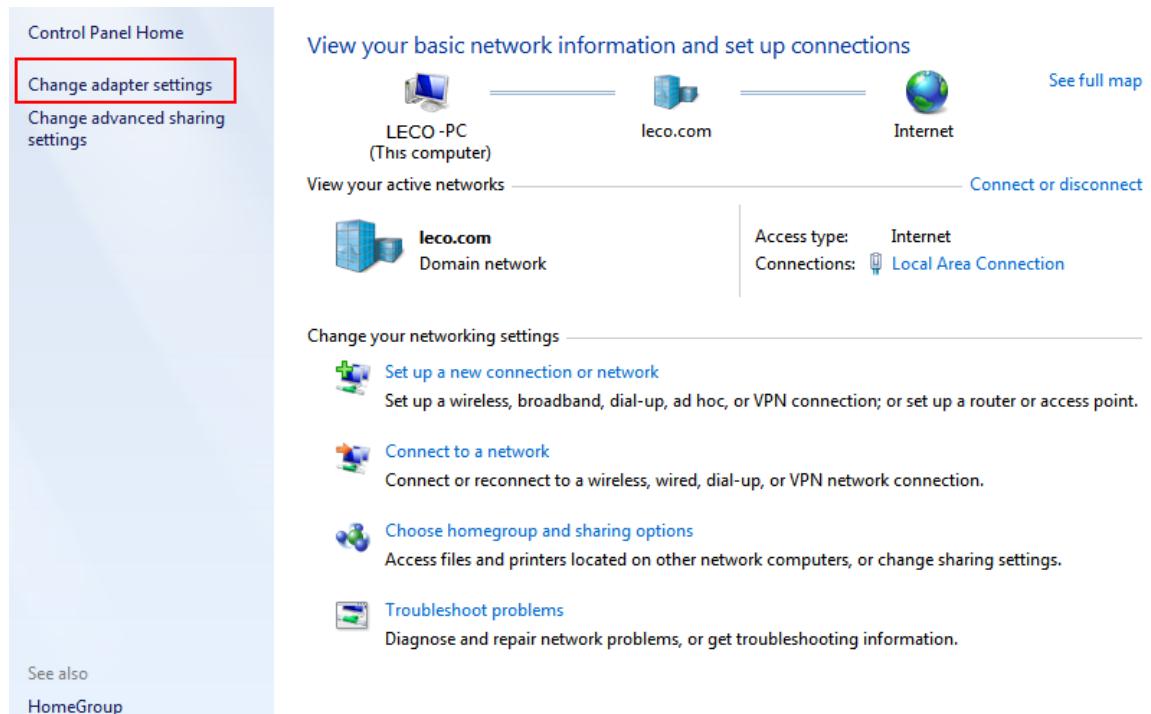
The following steps apply when using the *Windows 7* operating system.



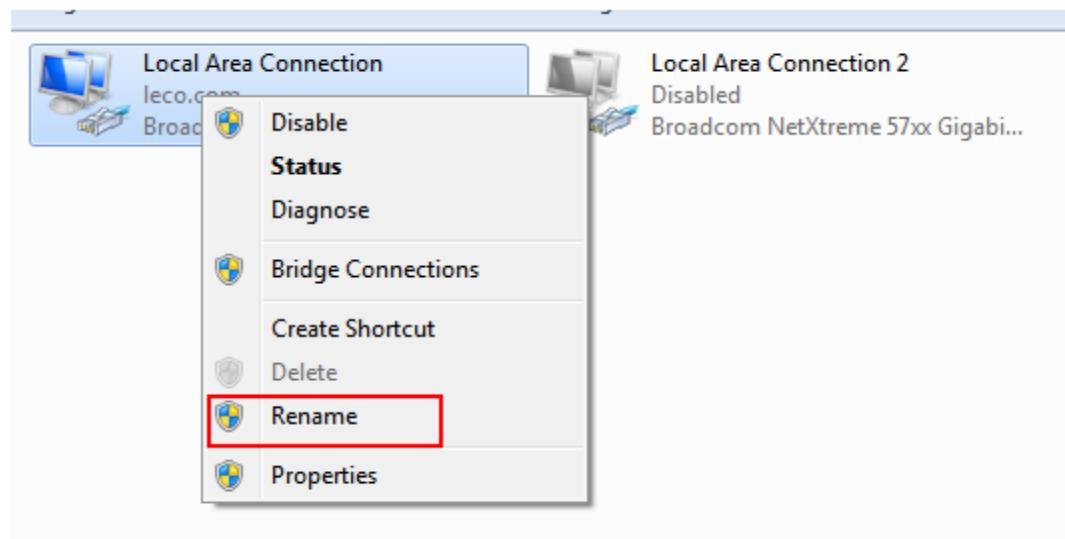
1. Select the Windows desktop and then select Control Panel.
2. Select Network and Sharing.

The screenshot shows the Windows 7 Control Panel under the heading "Adjust your computer's settings". The "View by: Small icons" option is selected. The "Network and Sharing Center" icon is highlighted with a red box. Other icons include Action Center, Color Management, Desktop Gadgets, Ease of Access Center, HomeGroup, JInitiator 1.3.1.28 (32-bit), Mouse, NVIDIA nView Desktop Manager, Power Options, RemoteApp and Desktop Connections, Sync Center, User Accounts, and Windows Update. To the right of the highlighted icon, there is a list of additional control panel items: Administrative Tools, Credential Manager, Device Manager, Folder Options, Indexing Options, Keyboard, Performance Information and Tools, Programs and Features, Revo Uninstaller Pro, System, Windows CardSpace, AutoPlay, Date and Time, Devices and Printers, Fonts, Internet Options, Location and Other Sensors, Notification Area Icons, Personalization, Recovery, Sound, Taskbar and Start Menu, Windows Defender, Backup and Restore, Default Programs, Display, Getting Started, Java (32-bit), Mail (32-bit), NVIDIA Control Panel, Phone and Modem, Region and Language, Speech Recognition, Troubleshooting, and Windows Firewall.

3. Select Change Adapter Settings.

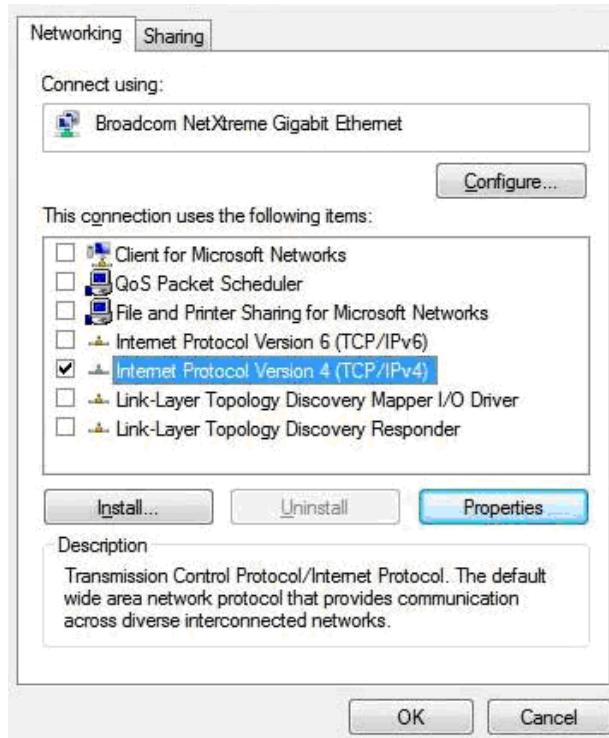


4. Right-click on the name of the connection for the instrument and rename it to LECO Hardware.

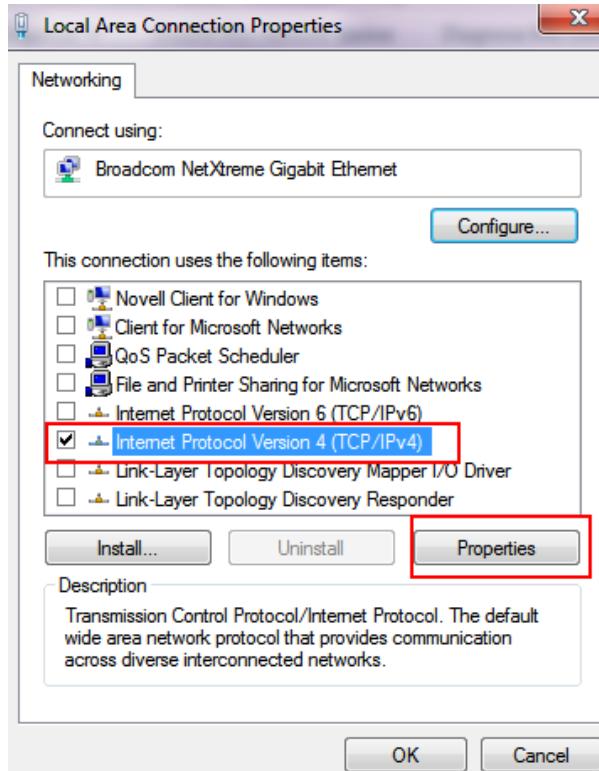


5. Right-click and select Properties.

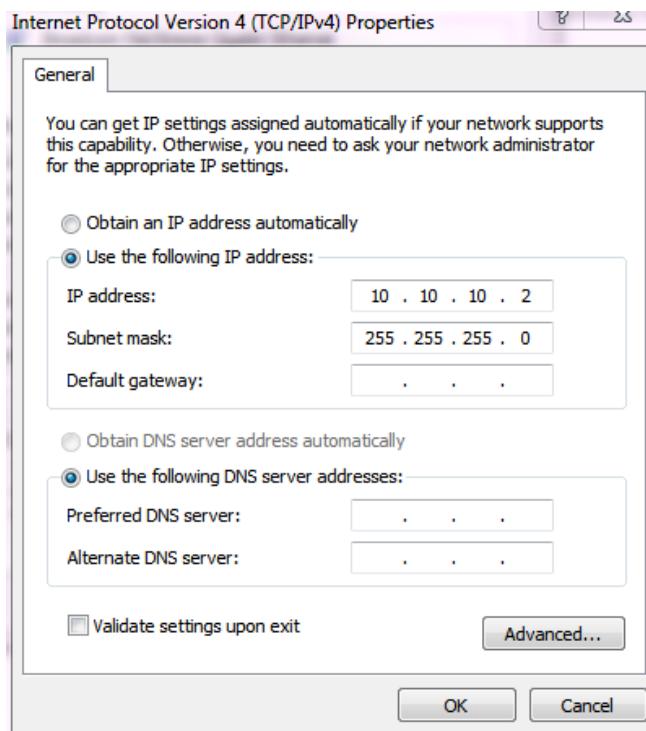
6. Clear all of the checkboxes except Internet Protocol Version 4 (TCP/IPv4).



7. Highlight Internet Protocol Version 4 (TCP/IPv4) by selecting it and then selecting Properties.



8. For IP address, enter 10 10 10 2, and for Subnet mask, enter 255 255 255 0. The remaining fields should be empty as shown in the following screen shot.

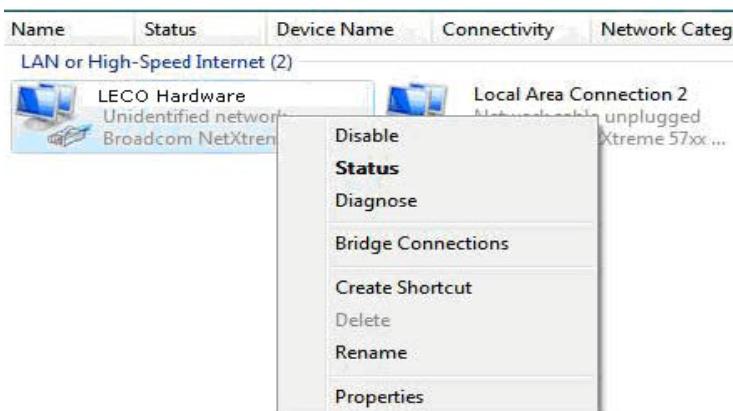


9. Select OK.

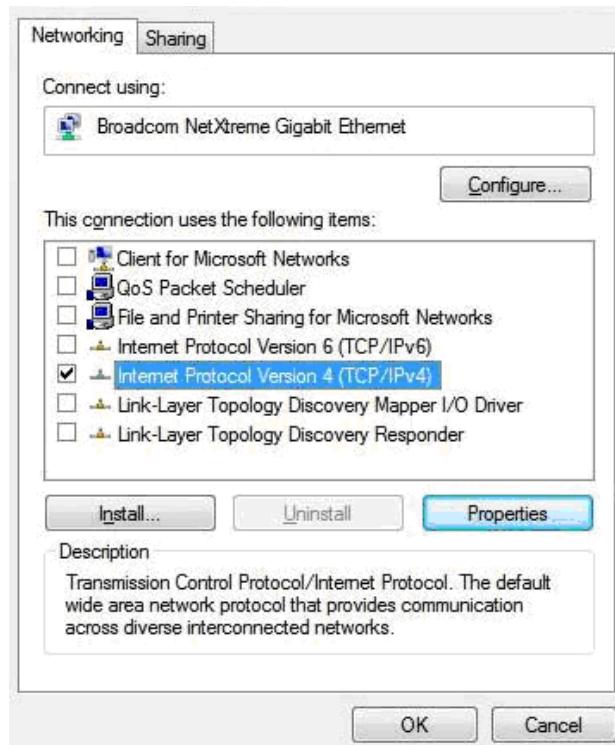
Windows Vista

The following steps apply when using the *Windows Vista* operating system.

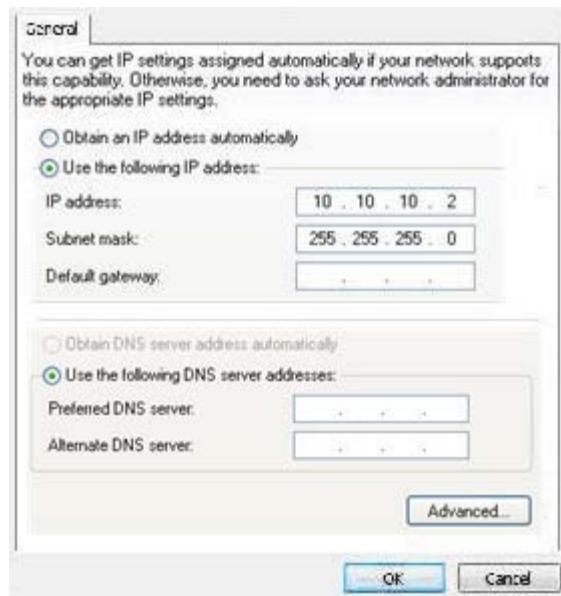
1. Select  the *Windows* desktop.
2. From the Start Menu, select Control Panel.
3. From the Control Panel, select Network and Internet, select Network and Sharing, and then select Manage Network Connections.
4. On the Manage Network Connections tab, select the connection that will be used for the instrument.
5. Select the name of the connection and rename it to LECO Hardware.



6. Right-click and select Properties.
7. Clear all of the checkboxes except Internet Protocol Version 4 (TCP/IPv4) as shown in the following screen shot.



8. Highlight Internet Protocol Version 4 (TCP/IPv4) by selecting it and then selecting Properties.
9. For IP address, enter 10 10 10 2, and for Subnet mask, enter 255 255 255 0. The remaining fields should be empty as shown in the following screen shot.
10. Select OK.

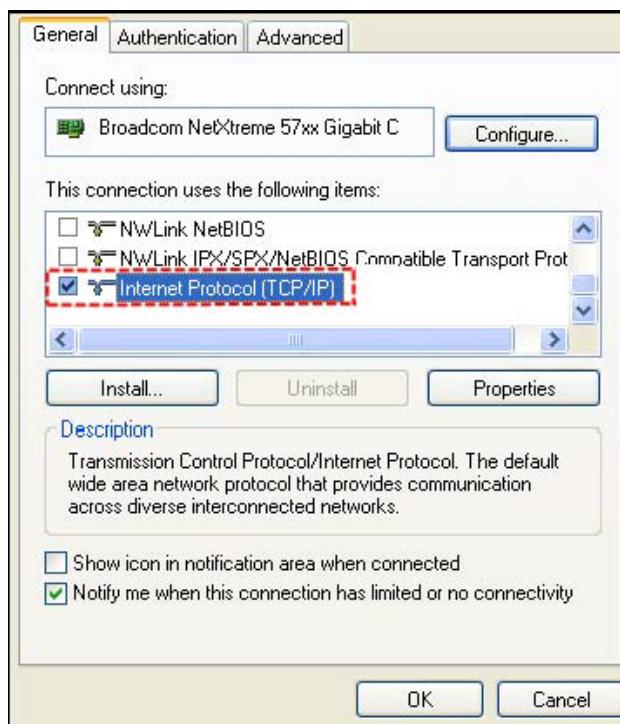


Windows XP

1. Determine if a network connection is installed as follows: select Start on the Windows desktop, select Settings, Control Panel, and then double-click on Network Connections. If a network connection exists, it will appear in the Network Connections dialog box. An example is displayed in the following screen shot.

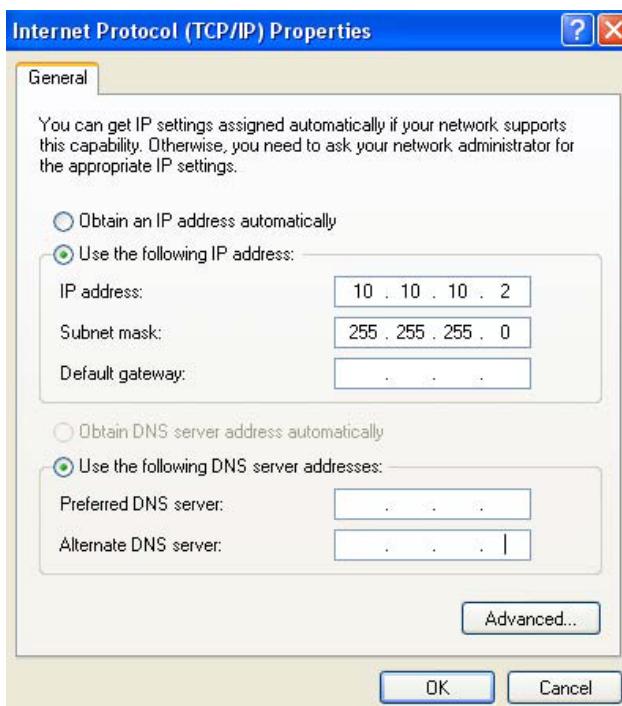


2. If a network connection is not installed, install an Ethernet adapter. Refer to the instructions supplied with the Ethernet adapter for installation procedures.
3. Once the Ethernet adapter is installed, and with the computer On, select Start, Settings, Control Panel, and then double-click on Network Connections.
4. Select the name of the connection for the instrument and then rename it to LECO Hardware.
5. Right-click on LECO Hardware and select Properties. The Properties dialog box will appear.



6. Select the Internet Protocol (TCP/IP) checkbox. The other checkboxes should be cleared.

7. Select Internet Protocol (TCP/IP) and select Properties. The TCP/IP Properties dialog box will appear.



8. Enter the IP address as 10 10 10 2.
9. Enter the Subnet Mask as 255 255 255 0.
10. Default Gateway, Preferred DNS Server and Alternate DNS Server should be left blank.
11. Select OK.
12. Select OK again to save the settings.

Configuring Firewall Settings

When the LECO software is installed, it automatically configures the *Microsoft Windows* firewall settings for the instrument software. (If the *Microsoft Windows* firewall settings are ever changed, the easiest fix is to reinstall the LECO software.)

The following steps apply only when a firewall program other than *Microsoft Windows* is used.

1. If another firewall program is installed, search all folders and subfolders in C:\Program Files\LECO and C:\Program Files\Common Files\LECO folders and note the .exe files that are found. For *Windows 7*, 64-bit OS systems, check C:\Program Files (x86)\LECO.



- NOTE** These are the default locations; however, the default location may vary if it was changed during the software installation.
2. Follow the instructions for the firewall program to grant these .exe files permission in order to run the LECO software.

Configuring DHCPLite

The following section explains the process for connecting an instrument controlling PC to a corporate network.

- NOTE** → When operating instrument with user permissions enabled and using domain names for logging in instead of local PC accounts, you must manually add each of the domain users to the list and assign them the appropriate permissions.

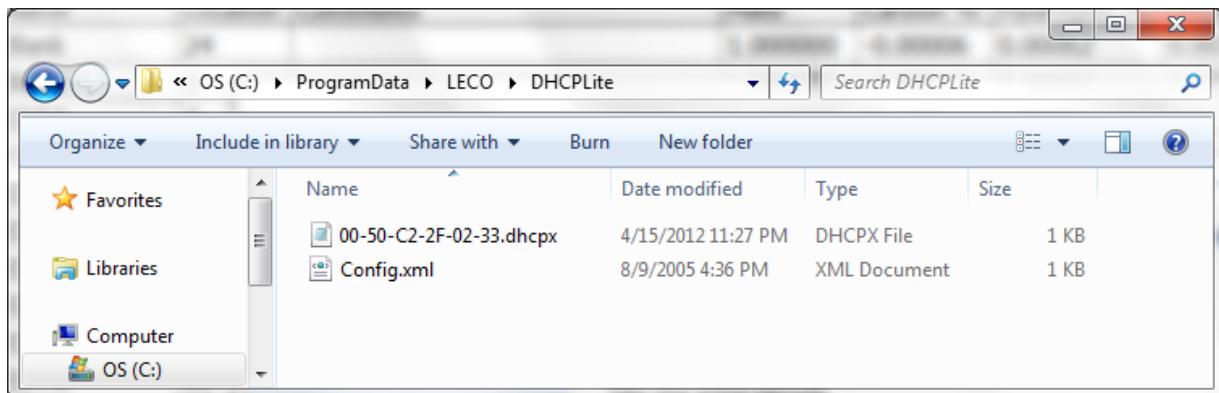
Connecting Instrument to a Network That Uses 10.10.10.x Addresses

The PC that controls the LECO instrument(s) has a network board dedicated to communicating with the LECO instrument(s). A unique IP address is assigned to that board. Unique IP addresses are also assigned to each LECO instrument connected to the PC. (One IP for the PC board and a different IP for each of the LECO instruments the PC controls.) This is in addition to any network connection to the corporate network which will have its own unique IP address.

- NOTES** →
- Make sure any non-LECO network traffic does NOT hinder data collection from the LECO instrument.
 - If the corporate network uses 10.10.10.x values, there could be a conflict with the PC and/or LECO instrument(s) IP addresses.

To prevent conflict:

1. Close the LECO instrument software.
2. Select  the Windows desktop and then select Control Panel.
3. Select Administrative Tools.
4. Open the Services status window.
5. Stop the "DHCPLite" Service.
6. Delete any existing .dhcpx files in C:\ProgramData\LECO\DHCPLite folder (or equivalent on older operating systems).



7. Open the C:\ProgramData\LECO\DHCPLite\Config.xml file (or equivalent on older operating systems).

- NOTE** → ProgramData is a hidden folder.

8. The ServerAddress is the IP address that will be used for the network card in the LECO instrument PC that is used for communicating with the LECO instrument(s).

Change the **ServerAddress** to an IP value that doesn't conflict with anything on the corporate network. The default value is 10.10.10.2. The value 10.10.10.1 is reserved.

NOTES →

- The IP of the board in the PC that connects to the LECO instrument(s) must also be changed in *Windows* to match. Refer to [Changing the IP Address for LECO Instruments in Windows, page 9–22](#).
 - The customer is responsible for ensuring that the IP addresses used for the LECO instrument(s) and PC are never assigned to anything else.
9. The AddressMin and AddressMax are the ending numbers for the IP address that will be generated for the LECO instrument itself. One unique IP will be created for each instrument, from within the #.#.#.min through #.#.#.max range, where #.#.# is from the first three sections of the ServerAddress.

Change the AddressMin and AddressMax values so that none of the values from #.#.#.min to #.#.#.max conflict with any existing #.#.#.x values being used on the corporate network. The default value is 3 for min and 254 for max. Make sure the range is large enough to ensure that every LECO instrument connected to the PC will have its own unique address.

NOTE →

- The customer is responsible for ensuring that the IP addresses used for the LECO instrument(s) and PC are never assigned to anything else.

Example

In the following, the PC that controls the LECO instrument(s) uses a network card for instrument communication that has an IP address of 10.10.10.2, and the IP address that will be generated for the LECO instrument(s) will be any address from 10.10.10.3 through 10.10.10.254. In this case, all addresses from 10.10.10.1 through 10.10.10.254 should NOT be used by the corporate network because they are reserved for communication with the LECO instrument(s).

```
<configuration>
    <add key="AddressMin" value="3"/>
    <add key="AddressMax" value="254"/>
    <add key="ServerAddress" value="10.10.10.2"/>
    <add key="SubnetMask" value="255.255.255.0"/>
</configuration>
```

1. Save changes made to config.xml.



2. Select the Windows desktop and then select Control Panel.
3. Select Administrative Tools.
4. Open the Services status window.
5. Restart the "DHCPLite" Service.
6. Start the LECO instrument software.

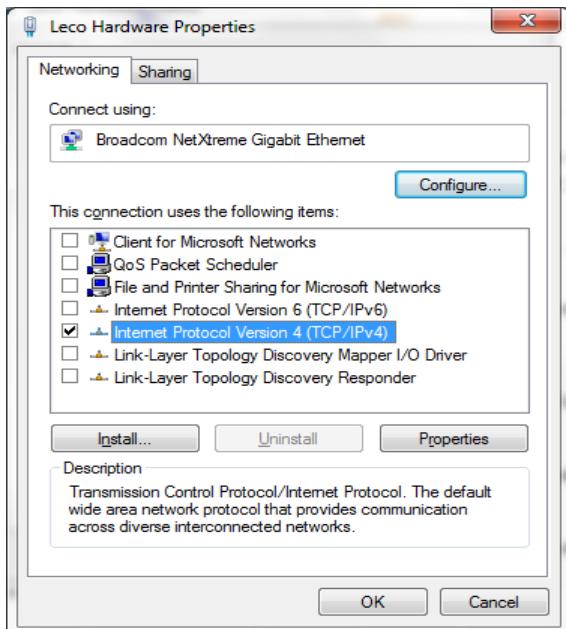
Changing the IP Address for LECO Instruments in Windows



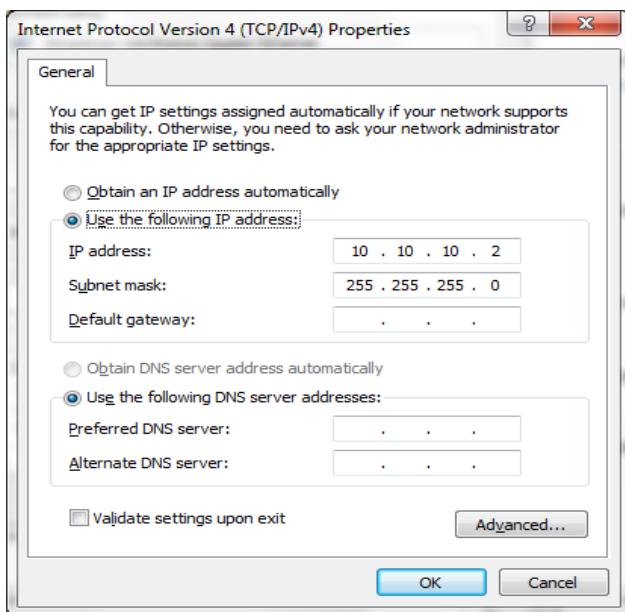
1. Select the Windows desktop and then select Control Panel.
2. Select Network and Sharing Center.
3. Select the LECO Hardware connection to open it.

NOTE → Make sure any virus scanning and security measures are turned Off for the LECO Hardware network connection.

4. A status window will come up. Select the Properties button.
5. In the Properties window, highlight the Internet Protocol Version 4 (TCP/IPv4) line and select Properties button.



6. Change the IP address to match the ServerAddress setting in config.xml.



Registering Software

To register software for a new instrument and PC from LECO, insert the copy protection key into a USB port. Refer to [Troubleshooting Copy Protection Key](#), page 9–28, for further information.

The following procedure applies when the license is being upgraded due to the addition of new hardware or a new software version. The software must be registered before it can be used. If a PC is not purchased from LECO, refer to [Submitting Registration Information to LECO](#), page 9–25, and contact LECO Service for further information about registering the instrument.

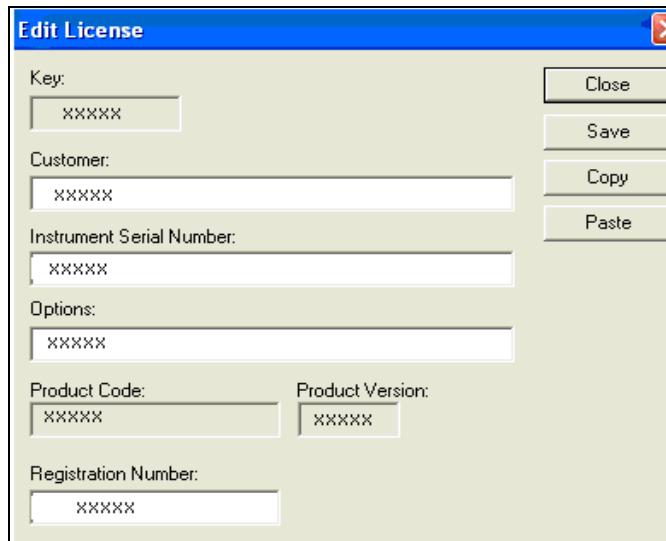


Do not insert the copy protection key into the USB port until the LECO software is installed and the PC has been rebooted.

1. Install Copy Protection Key into a USB port on the computer.
2. Double-click the software's desktop icon.
3. In the software's main window, select Help and then select About. The following dialog box appears:



4. Select Change. The Edit License dialog box will appear.



5. Registration information can be entered in two ways, explained as follows. It is preferable to copy and paste the information to help avoid errors.
- Type in the registration information exactly as it appears.
 - If the upgrade information is received in an email from LECO, copy and paste the registration information as explained in the following steps.
- A. In the email, highlight the information beginning with <base64> </base64> as shown in the following screen shot.

```
<base64>
58
D7IJxwMAvPoSTEVDTyBEb2N1bVVudGFOaW9ulpBOAQ1HQ3hHQyBTY3JpcHRzAA1j
ZW8ydmld1dGuIEw==
</base64>
```

- B. Copy the information by pressing at the same time Ctrl and C on the keyboard.
- C. On the Edit License dialog box, select Paste. (Do not press Ctrl and V on the keyboard.)
- D. Select Save.
- E. Select OK when the following dialog box appears:



Troubleshooting Software Registration

Error Message	Checks and Solutions
Invalid Registration Error Message 	Verify all entries in the Edit License dialog box exactly match the registration information. Check capitalization. Check that the product version is correct. For example, the Product Version in the Edit License dialog box will appear as 400 (no period), but on the Help/About dialog box, the product version will appear as 4.00 (with a period). Check that the registration number is correct. Check that the spacing between words is accurate.

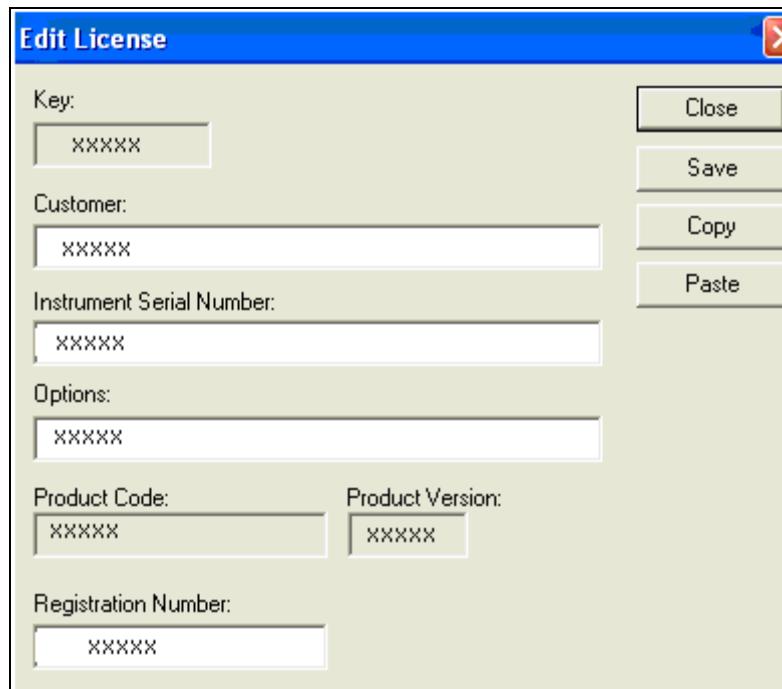
Submitting Registration Information to LECO

If the PC is not purchased from LECO, it may be necessary to submit the registration information to LECO Service. Contact LECO Service to assist you in the registration process. LECO Service will require your company name, serial number, model number, and any options purchased. The following section explains this procedure.

1. In the software, select Help and then select About.
2. On the About dialog box, select Change.



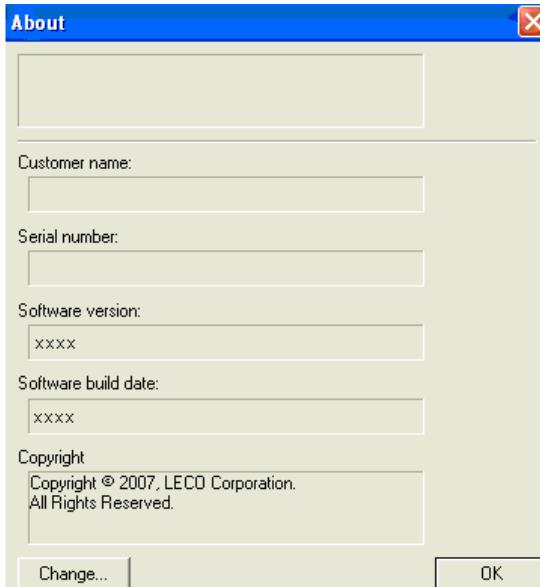
3. The Edit License dialog box will appear. Enter your Customer (company), Instrument Serial Number, and Options.



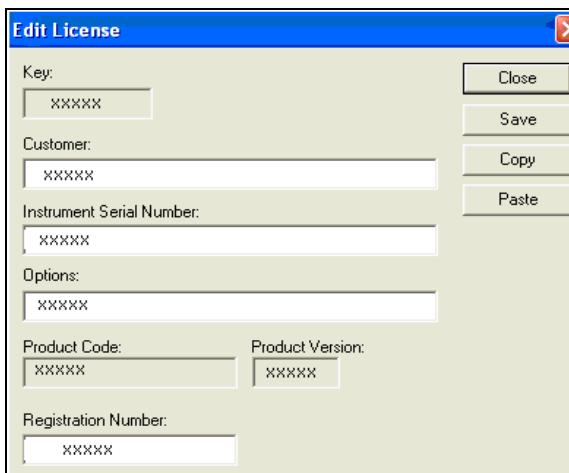
4. Select Copy.
5. Open a blank email message and press Ctrl and V on the keyboard to paste the license information into the email message.
6. Send the email or just the Key number to the LECO designee.

Adding an Option or Changing Customer Name

1. Request/purchase option from LECO. LECO will provide a new key number and registration information.
2. In the software, select Help on the Menu bar and then select About.
3. On the About dialog box, select Change.



4. The Edit License dialog box will appear.



5. Registration information can be entered in two ways, explained as follows. It is preferable to copy and paste the information to help avoid errors.
 - Type in the registration information exactly as it appears.
 - If the upgrade information is received in an email from LECO, paste the registration information as explained in the following steps.
 - A. Select all of the text in the email from LECO.
 - B. On the Edit License dialog box, select Paste. The information from the email, including customer name and any options will appear in the Edit License dialog box.
 - C. Select Save.

Troubleshooting Copy Protection Key

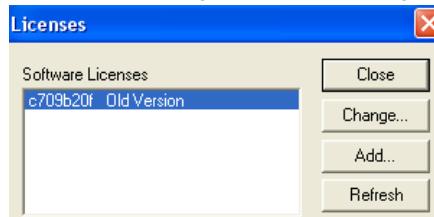
- A Copy Protection Key is required to use the software.
- Do not insert the copy protection key into the USB port until the LECO software is installed and the PC has been rebooted.
- The Copy Protection Key should remain installed in one of the USB ports while using the software.

Copy Protection Key Error Messages



The Copy Protection Key Not Found or License Not Valid dialog box may appear if the copy protection key is not installed, the software is not registered, or the software is already running. Complete the following steps.

- Verify that the copy protection key is installed. If it is not:
 1. Select OK, and then insert the copy protection key.
 2. On the Licenses dialog box, select Close. The software login will appear.
- If the copy protection key is installed, the software may not be registered.
 1. Select OK.
 2. Insert the copy protection key. The Licenses dialog box will appear.



3. Select the old version and then select Change. Follow the instructions in [Registering Software](#), beginning with step 5.
- If the copy protection key is installed, the software may already be running on the computer. Select Close.



Loading Head Alignment and Adjustment

Initial Alignment

NOTE

Before the load head assembly is ever placed onto the load head interface block, the following procedure must be followed to ensure easy removal/installation of the load head assembly.

1. Loosen the following screws to allow alignment of the loading head assembly to the load head interface block on the dual furnace assembly.
 - A. Loosen the two screws that secure the male mounting Block to the loading head assembly. Refer to Figure 9-1, page [9-30](#).
 - B. Loosen the screw that secures the connector assembly to the male mounting block.
 - C. Loosen the two setscrews in the Male Mounting Block.
 - D. Loosen the two screws that secure the female mounting block to load head interface block on the furnace assembly.
 - E. Loosen the screw that secures the connector assembly to the female mounting block.
 - F. Back off the setscrew in the female mounting block.
2. With everything in step 1 loosened, carefully align the loading head assembly and the load head interface block on the furnace assembly.
3. Grab the loading head at each side, carefully line up the male electrical connector on the loading head and the female connector on the loading head interface block. At the same time, make sure the three nipples from the loading head are lined up with the bores on the load head interface block. Once aligned, push down. You may hear a hissing sound.
4. Tighten the captive screws in the loading head to secure it to the loading head interface block. Any hissing sound should disappear. If a hissing sound continues, remove load head and refer to the [Cleaning the Loading Head Interface Block](#), page [9-32](#).
5. After the loading head is secured to the load head interface block.
 - A. Tighten the screw that secures the connector assembly to the female mounting block.
 - B. Tighten the setscrew in the female mounting block until it hits the base loading head.
 - C. Tighten the two screws that secure the female mounting block to the base loading head.
 - D. Tighten the screw that secures the connector assembly to the male mounting block.
 - E. Tighten the two setscrews in the male mounting block until it hits the loading head top.
 - F. Tighten the two screws that secure the male mounting block to the load head assembly.

6. To check alignment, remove and install the TruSpec® loading head assembly.
7. If load head is easily removed and installed, then you have successfully aligned the *TruSpec* load head assembly.
8. If the loading head is NOT easily removed and installed, then repeat steps 1 through 4.

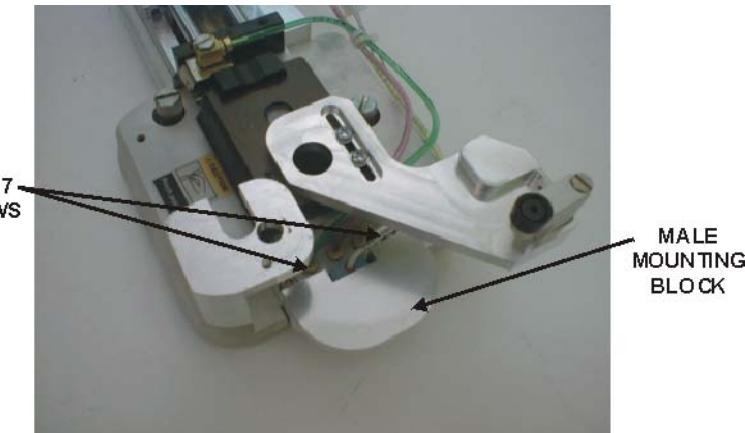


Figure 9-1
Loading Head Alignment—Part 1

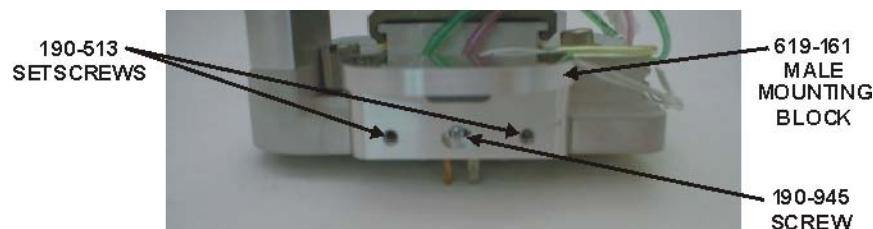


Figure 9-2
Loading Heading Alignment—Part 2

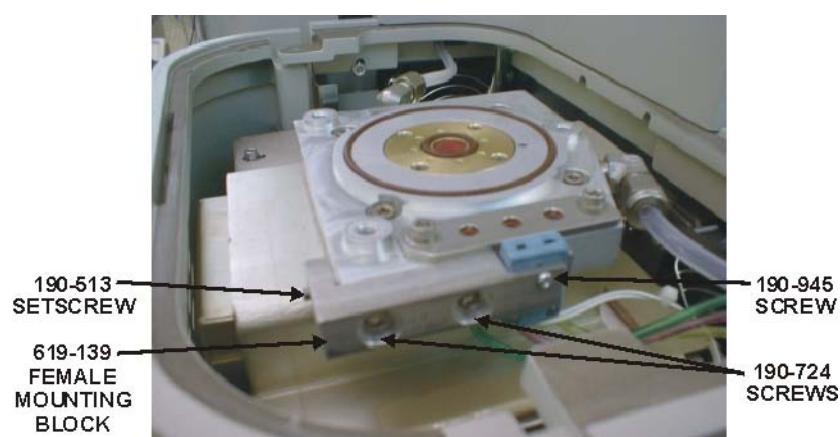


Figure 9-3
Loading Heading Alignment—Interface Block

Initial Adjustment

1. Adjust slide block speed by completing the following steps:
 - A. Select Diagnostics and select Solenoids and Switches.
 - B. Uncheck the Slide Block Seal, SV18, to turn it Off.
 - C. From the Diagnostics screen, toggle the slide block, SV13 and SV14, open and closed. Adjust the speed control screws on SV13 and SV14 to slow the movement if necessary.

NOTE → Solenoid valves SV13 and SV14 are the only valves on the pneumatics manifold that have speed adjustments.

2. Adjust the carousel indexer. Refer to [Carousel Alignment](#), page 9–33.



Figure 9-4
Slide Block Speed Adjustments

Cleaning the Loading Head Interface Block

This procedure should be used to clean and service the Loading Head Interface Block. Perform the Instrument Shutdown procedure before removing the Loading Head. Refer to [Shutdown Procedure](#), page 5–10.

Disassembly

1. Turn Off the pneumatic gas supply.
2. Remove the loading head. Refer to [Loading Head Alignment and Adjustment](#), page 9–29.
3. Remove top furnace plate.
4. Refer to the procedure outlined in [Replacing the Crucible](#), page 6–17, and remove the lance assembly.
5. Remove and inspect 601-504 Loading Head Block Interface Seal O-ring. Lightly apply a thin coating of vacuum grease to the o-ring.
6. From Diagnostics, access the Solenoids and Switches screen.
 - A. Toggle the Set Slide Block Seal (SV18) solenoid to relieve pressure in lines.
 - B. Toggle Slide Block Open and Close (SV13/SV14) solenoid to relieve pressure in lines.
7. Remove the two 8-32 190-867 Socket Head Screws, which secure the valve cap.
8. Carefully remove the valve cap. Verify that the three o-rings underneath the valve cap remain on the interface block.
9. Inspect and clean valve cap.
10. Inspect and clean three o-rings. Lightly apply a thin coating of vacuum grease to the o-rings.
11. Remove two 805-079 Ball Bearings and two 617-212 Springs from two outside bores.
12. Inspect and clean the balls, springs, and holes.

Assembly

1. Insert two 617-212 Springs into two outside holes in the load head interface block. Springs cannot be inserted into middle hole.
2. Place two 805-079 Ball Bearings into two outside holes in the load head interface block.
3. Lightly coat the o-rings with vacuum grease and place the three o-rings into the three holes on the load head interface block.
4. Place the clean valve cap onto load head interface block. Line-up the corresponding holes on the valve cap to the mating holes on the load head interface block. Tighten the screws to secure valve cap.
5. Install the loading head to interface block seal o-ring.
6. Apply a light coating of vacuum grease to the o-ring on top of the lance assembly and install the lance assembly into the loading head.
7. Turn On the pneumatic gas supply.

Carousel Alignment

Alignment must be after once the loading head is adjusted. Refer to [Loading Head Alignment and Adjustment](#), page [9–29](#).

When the carousel is properly adjusted it will not make a ringing noise when actuated.



PINCH HAZARD

Keep your hands away from the carousel and loading head during operation.

1. Select Diagnostics and then select Solenoids and Switches.
2. Uncheck the Slide Block Seal (SV18) solenoid to open it.
3. Select the Slide Block solenoid (SV13/SV14) and move the slide block to the closed position.
4. Loosen the carousel actuator arm mounting screws. Refer to [Figure 9-5](#), page [9–34](#).
5. Position the hole in the center of the arm over the hole in the slide block.
6. Be sure that the edges of the two pieces are parallel.
7. Tighten the carousel actuator mounting screws just enough that the arm can be moved along the slot.
8. Place the carousel on the loading head.
9. The lever on the arm should line up with the tooth on the carousel. If it doesn't move the actuator arm until it does. Refer [Figure 9-6](#), page [9–34](#).
10. Once it is aligned, take the carousel off and tighten the two screws.
11. Place the carousel back on the loading head and cycle the Slide Block solenoid several times to ensure that it is indexing the carousel one position at a time.
12. If the carousel is moving too fast or to slow in either direction, adjust the speed controls on solenoid valves SV13 and SV14. Refer to [Figure 9-4](#), page [9–31](#).

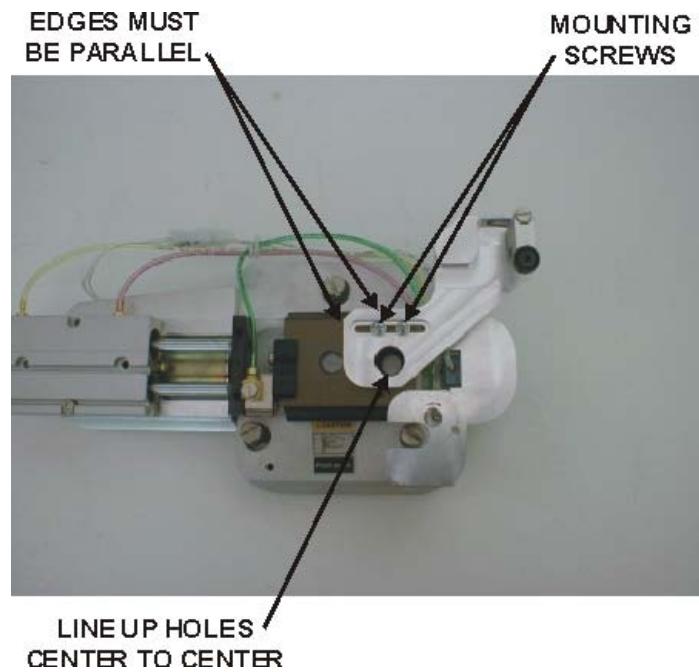


Figure 9-5
Carousel Actuator Arm Alignment



Figure 9-6
Carousel Alignment

Removing and Servicing the TC Cell

This procedure should be used to clean and service the TC Cell.

Perform the instrument shutdown procedure before removing the TC cell. Refer to [Shutdown Procedure](#), page 5-10.



SHOCK HAZARD

Turn the AC power OFF and disconnect the instrument from the facility electrical power source.

Removing

1. Remove the right side panel from the instrument.
2. Remove the plastic cover from the oven assembly.
3. Loosen the TC cell thumbscrew.
4. Remove the TC cell cover.
5. Disconnect the network electrical connection to the TC cell.
6. Loosen the Captive Screw.
7. Pull the TC cell away and out of the oven.

Servicing

1. Check the condition of the o-rings. If they are cracked, torn, or worn, replace them.
2. If you having a problem with the TC Cell, ambient values, a gas leak, or measurement results, contact the LECO Service Department for further information.

Removing and Servicing the IR Cell

This procedure should be used to clean and service the IR Cell.

Perform the instrument shutdown procedure before removing the IR cell. Refer to [Shutdown Procedure](#), page 5-10.



CAUTION

When performing maintenance on Genesis IR cells, use care not to touch optical surfaces and to prevent contamination of windows and filters by airborne dust or fibers. Prior to reassembly, inspect all optical surfaces for contaminations. Blow/clean dust or fibers with dry air. Clean fingerprints with isopropyl alcohol and 100% cotton swab. Optical surfaces included emitter and detector housings, short cell bodies, emitters, detectors, and gold tubes.



WARNING

SHOCK HAZARD

Turn Off the AC power and disconnect the instrument from the facility electrical power source.

Removing

1. Remove the right side panel from the instrument.
2. Remove the plastic cover from the oven assembly.
3. Remove the foam insulation covering the IR cells.
4. Remove the two IR cell mounting screws.
5. Pull the IR cell away and out of the oven.

Servicing

1. Check the condition of the o-rings. If they are cracked or worn, replace them.
2. If you having a problem with the IR Cell, IR Cell ambient values, a gas leak, or measurement results, contact the LECO service department for further information.

Cleaning

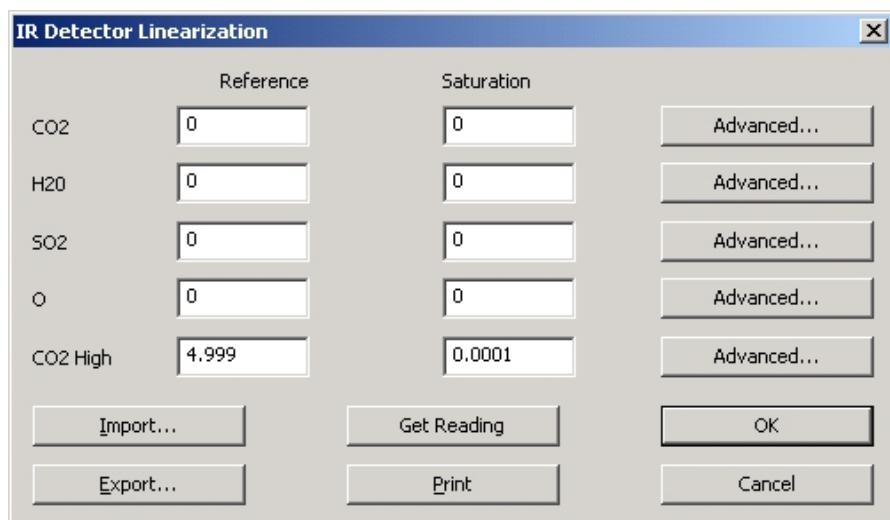
1. Only if necessary, remove the detector assembly to clean the tube with isopropyl alcohol and a 100% cotton swab. Allow tube to dry thoroughly.
2. Prior to reassembly, inspect all optical surfaces for contamination. Blow/clean dust or fibers with oil-free dry air or inert gas. Clean fingerprints with isopropyl alcohol and 100% cotton swab.

IR Detector Linearization

Before the instrument or a replacement IR detector is installed at a customer site, the reference and saturation values are determined for the IR detector. These values are entered by LECO into the software to produce correct analytical results. For accurate analysis results, these values must match characteristics of the detector. The following procedure should only be used if an IR detector is replaced or if the values have been lost and need re-entered.

NOTE → It is only necessary to perform this procedure if an IR detector is replaced. The reference and saturation values to enter during this procedure can be found on a tag attached to the replacement IR detector.

1. Select Configuration and select IR Detectors. The IR Detector Linearization screen will appear.



2. All the IR Detectors for the system are listed. If the IR detector has been replaced, enter the reference and saturation that are provided on the tag attached to the replacement IR detector.
3. Refer to the IR Detector Linearization Definitions, page [9–38](#), for additional information.

IR Detector Linearization Definitions

Reference—The output voltage of the cell when no analyte is present.

Saturation—The output voltage of the cell when the maximum amount of analyte it can measure is present.

Advanced—Used to access the break and slope table. Refer to [Break and Slope Values](#), page 9–38.

Import—Used to import a file of reference and saturation values that had been previously exported for all IR detectors. This will overwrite the reference and saturation values for all detectors. Ensure the values being imported are correct for the currently installed detectors before you import them.

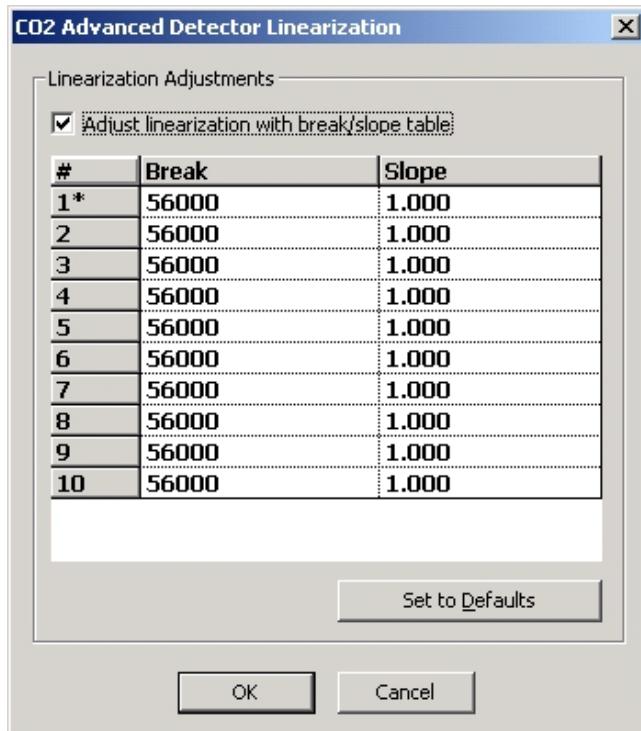
Export—Used to export or save a file of reference and saturation values for all IR detectors.

Get Reading—Used to enter the reference and saturation values by running the appropriate amount of analyte (none or max) through the system and capturing the voltage.

Print—Used to print out the reference and saturation values. If a break and slope table is used, it will also print.

Break and Slope Values

NOTE → The Break and Slope values are not used by LECO but can be used by the operator to customize their instrument.



Checkbox—specifies whether or not the break and slope table should be used.

Break and Slope—allows advanced customization of the detector's linearization.

Set to Defaults—resets the table back to the original factory default values.

IR Cell Saturation Optimization

This procedure will automatically adjust the Carbon and Sulfur IR detectors saturation value, improving the characterization of the individual IR detector in the instrument as a system. This procedure should be used during the installation of new Carbon and Sulfur IR Cells. It can also be used to compensate for minor variations over the life of the Carbon and Sulfur IR cell.

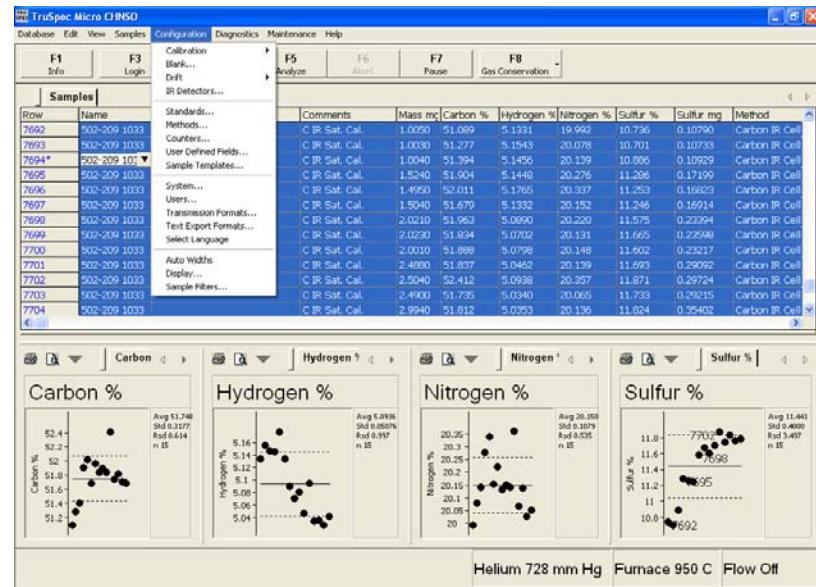
NOTE

Sulfamethazine (502-209) is required to perform this procedure.

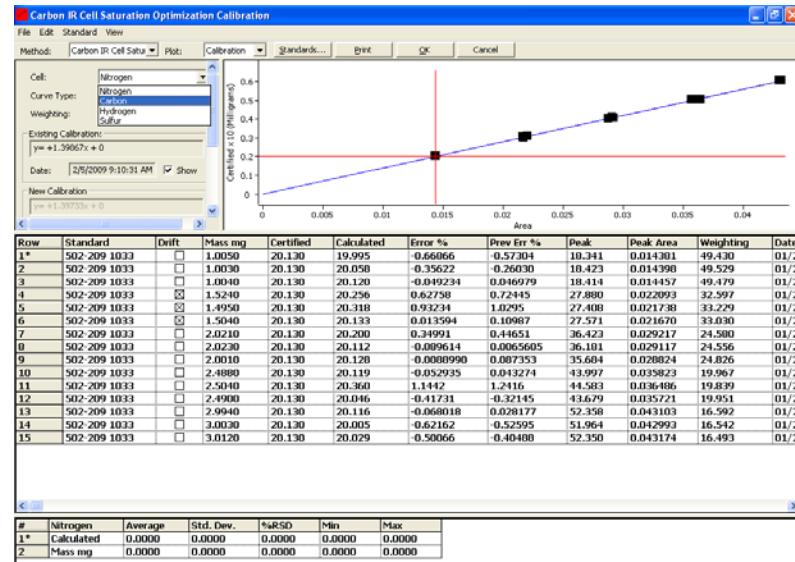
1. Add a method to the software using all of the default method properties. Refer to [Creating a Method](#), page 4-44.
2. Select Diagnostics and select Leak Check. Refer to [Leak Check](#), page 8-14.
 - A. Perform leak check.
 - B. Step A must pass before continuing.
3. Select Diagnostics and select Systems Check.
 - A. Perform a Systems Check.
 - B. All steps within the Systems Check must pass.
4. Analyze 15 blanks. Refer to the [Blank Login](#), page 5-12
5. Choose the last ten blank results to calculate the statistical results. The standard deviation of the last 10 blanks should be less than or equal to 12 ppm or 0.1% for carbon.
6. Set the system blank based on the last ten blank results run in step 5. Refer to the [Blank Calibration](#), page 5-26.
7. Define Sulfamethazine as a calibration standard within the software. If further information is required, refer to [Defining Calibration Standards](#), page 4-55.
8. Analyze three samples of Sulfamethazine at approximately 1 mg. These samples are used for conditioning and will not be used for analytical purposes later.
9. Analyze the samples listed in the following table. Use the Method created in step 1. Log in each sample using the drop-down box in Name for the EDTA samples.

Replicates	Standard	Mass (mg)
3	Sulfamethazine	~0.5
3	Sulfamethazine	~1.0
3	Sulfamethazine	~1.5
3	Sulfamethazine	~2.0
3	Sulfamethazine	~2.5
3	Sulfamethazine	~3.0

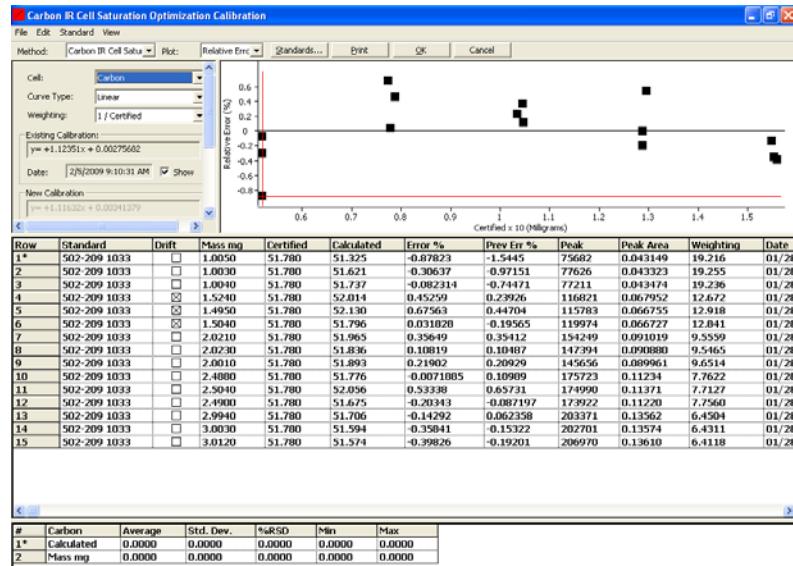
10. Select the set of data run in step 9 and select Configuration, then select Calibration.



11. Select the Carbon cell from the cell drop-down box.

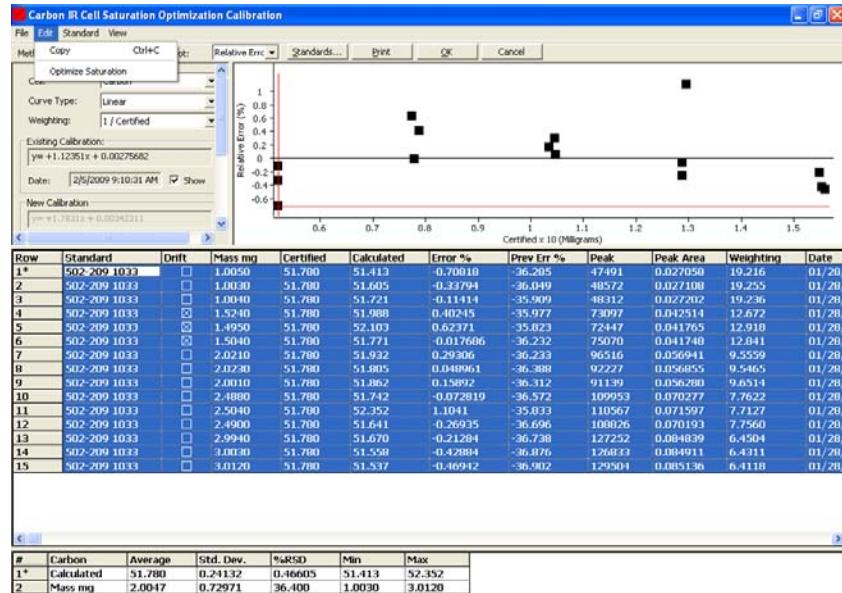


12. Change the plot to Relative area in the Calibration screen.



13. Within the grid of the calibration screen, select the results of the Sulfamethazine analyses.
 14. Select Edit and select Optimize Saturation.

NOTE → If any of the data points are shown in red and excluded automatically, override them and include the points by double-clicking on the excluded data row within the grid.



15. The software will automatically calculate an optimized saturation value for the Carbon IR Cell and display a dialogue box with the new and previous Carbon IR cell saturation values. Select OK to accept the new Carbon IR Cell Saturation value.
 16. Recalibrated all the existing methods within the database using the new carbon IR settings and table.

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10 Illustrations

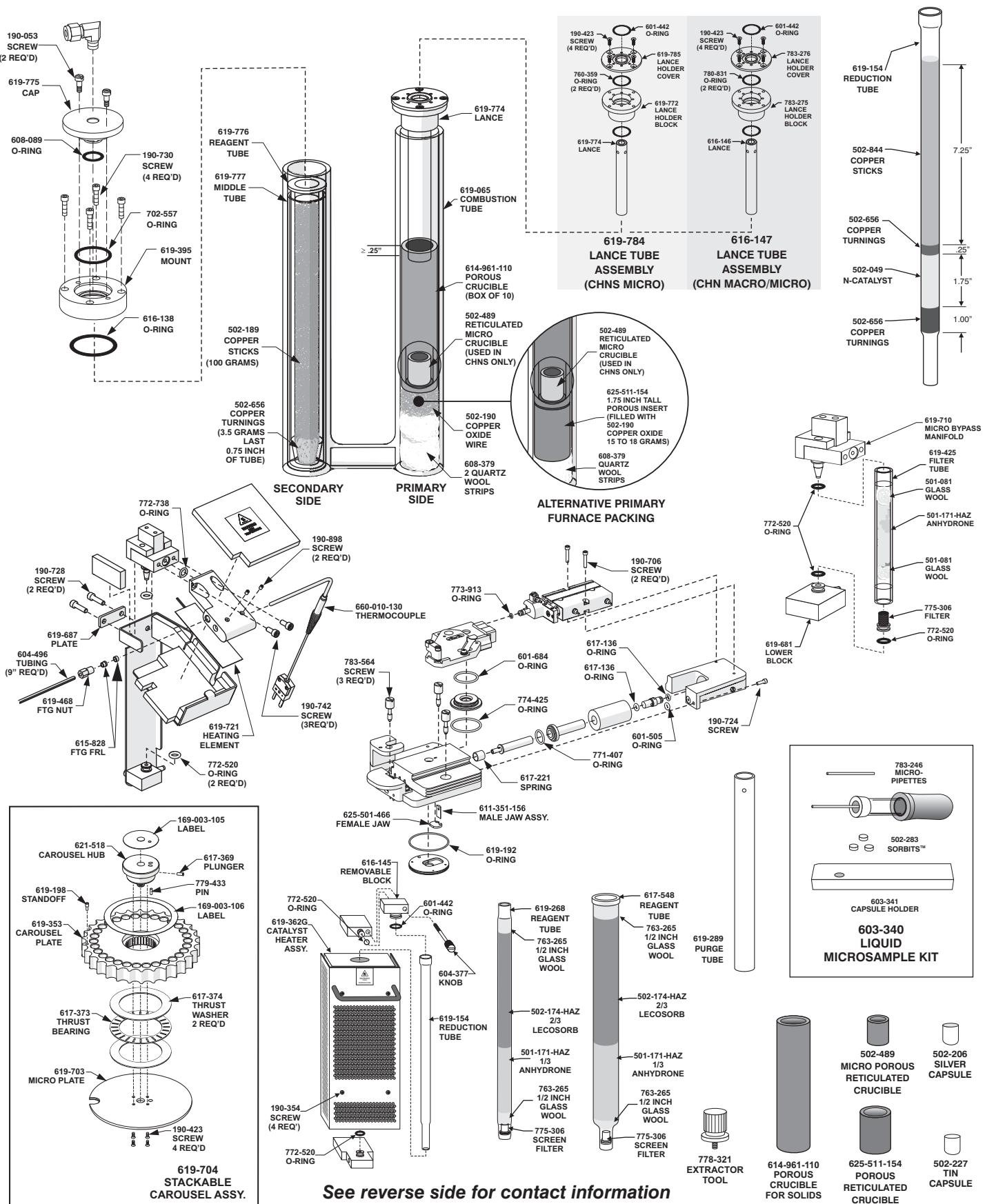
The Illustration chapter can be used to locate parts within the instrument and part numbers.

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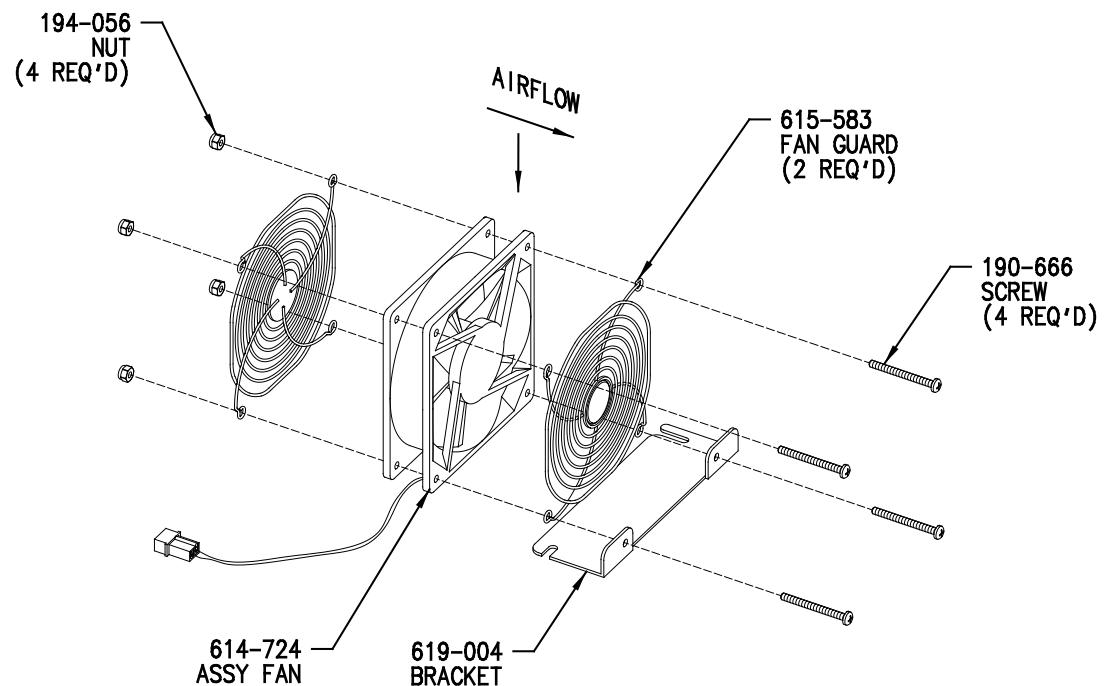
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TruSpec Micro Consumables & Spare Parts Reference Card

Note: Part numbers and standards' values may change. Consult LECO for the latest information.

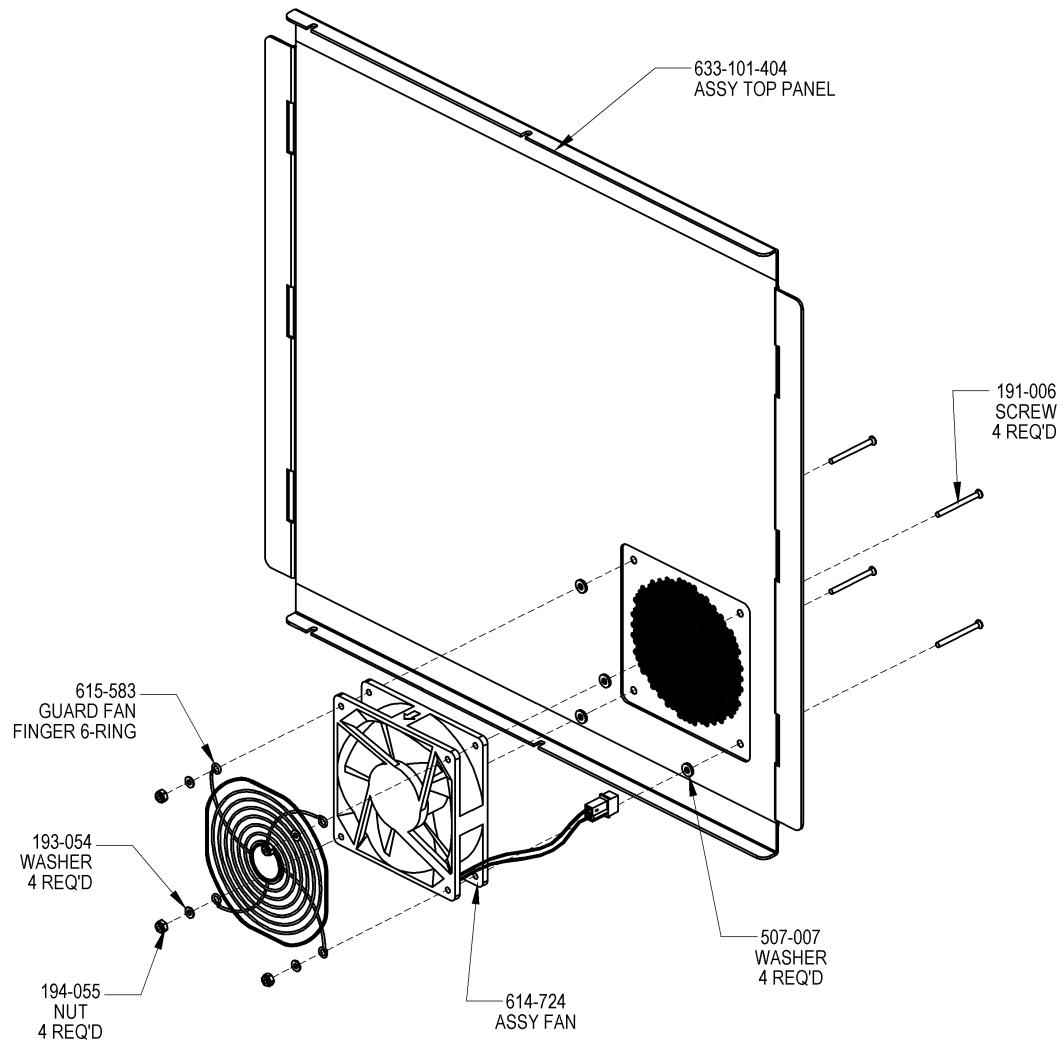


See reverse side for contact information



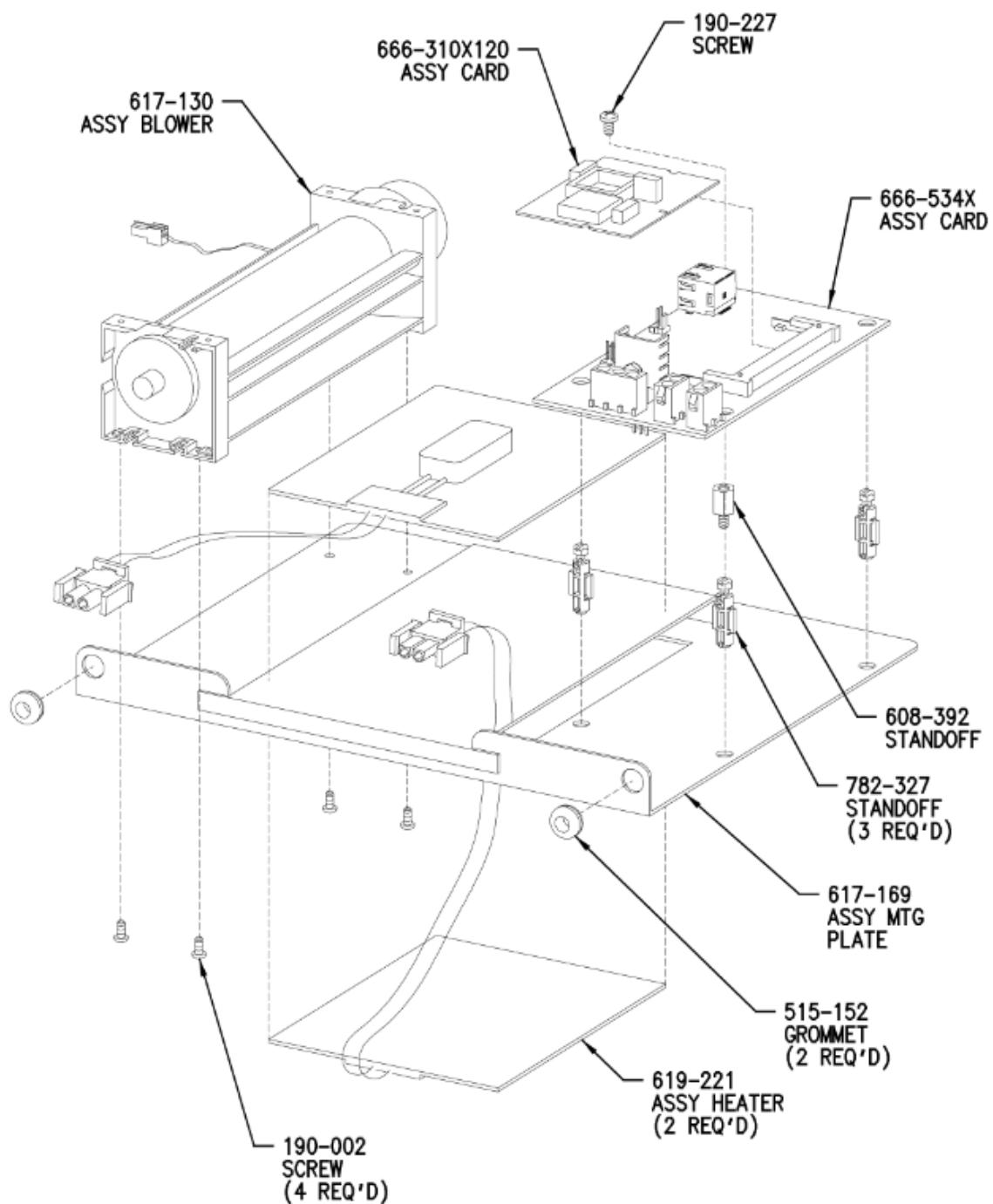
ILS-00309-000

Figure 10-2
Mounted Fan Assembly 619-003



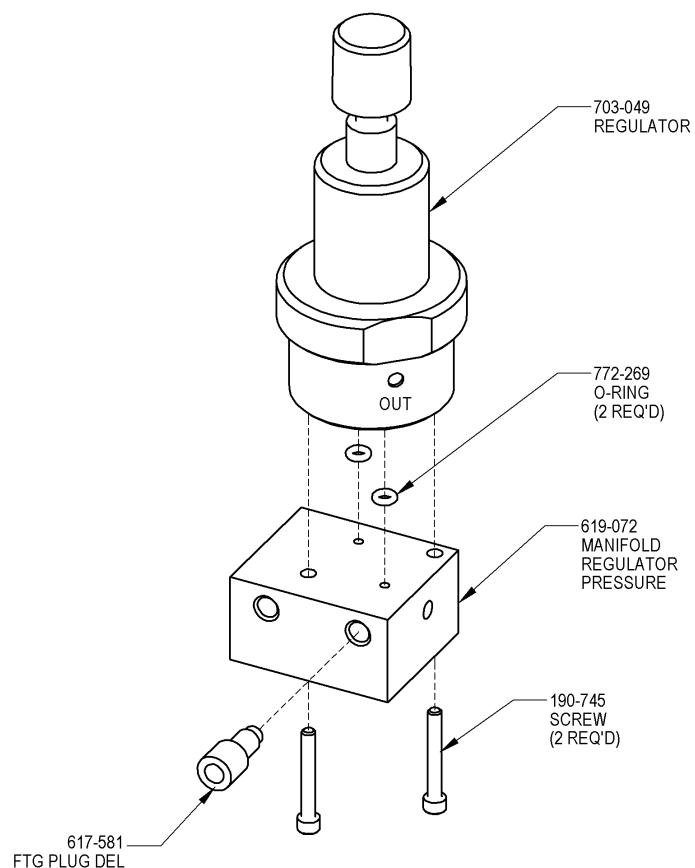
ILS-00551 - C

**Figure 10-3
Top Panel Assembly**



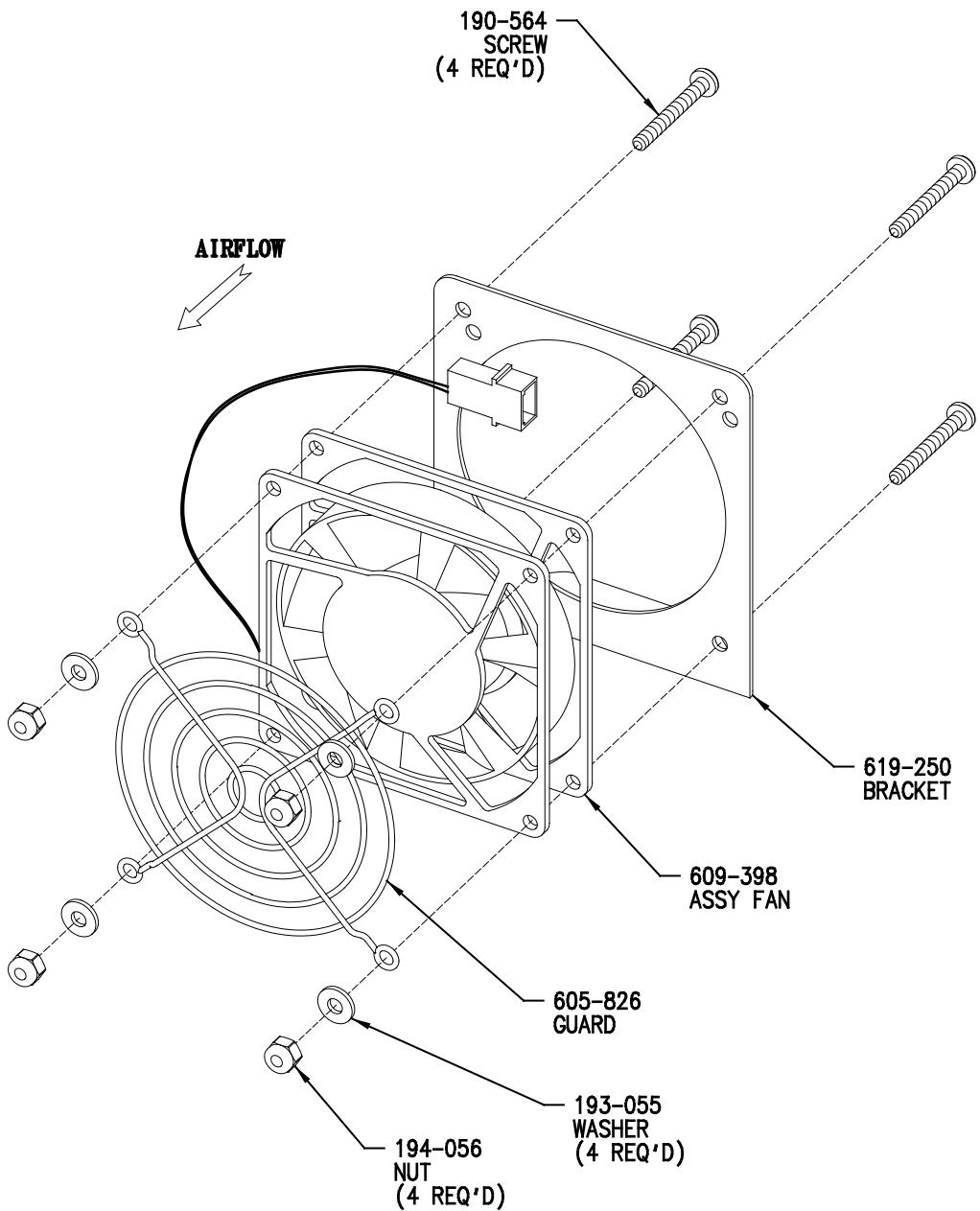
ILS-00312-B

Figure 10-4
TC Oven Assembly



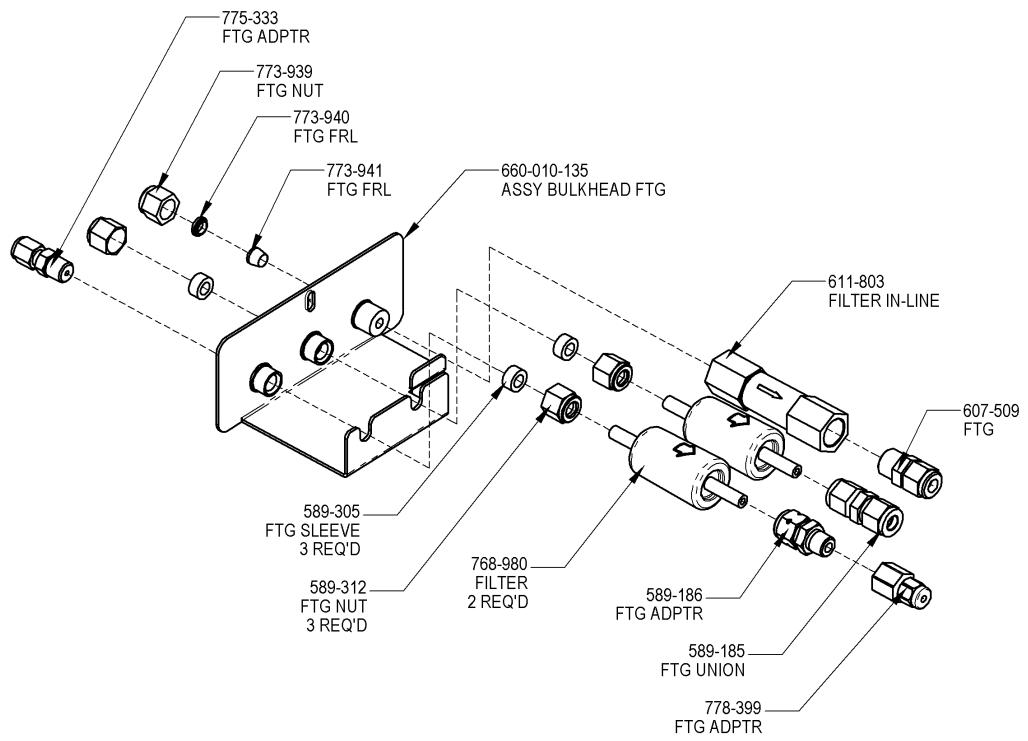
ILS-00552-A

Figure 10-5
Helium Manifold Regulator Assembly



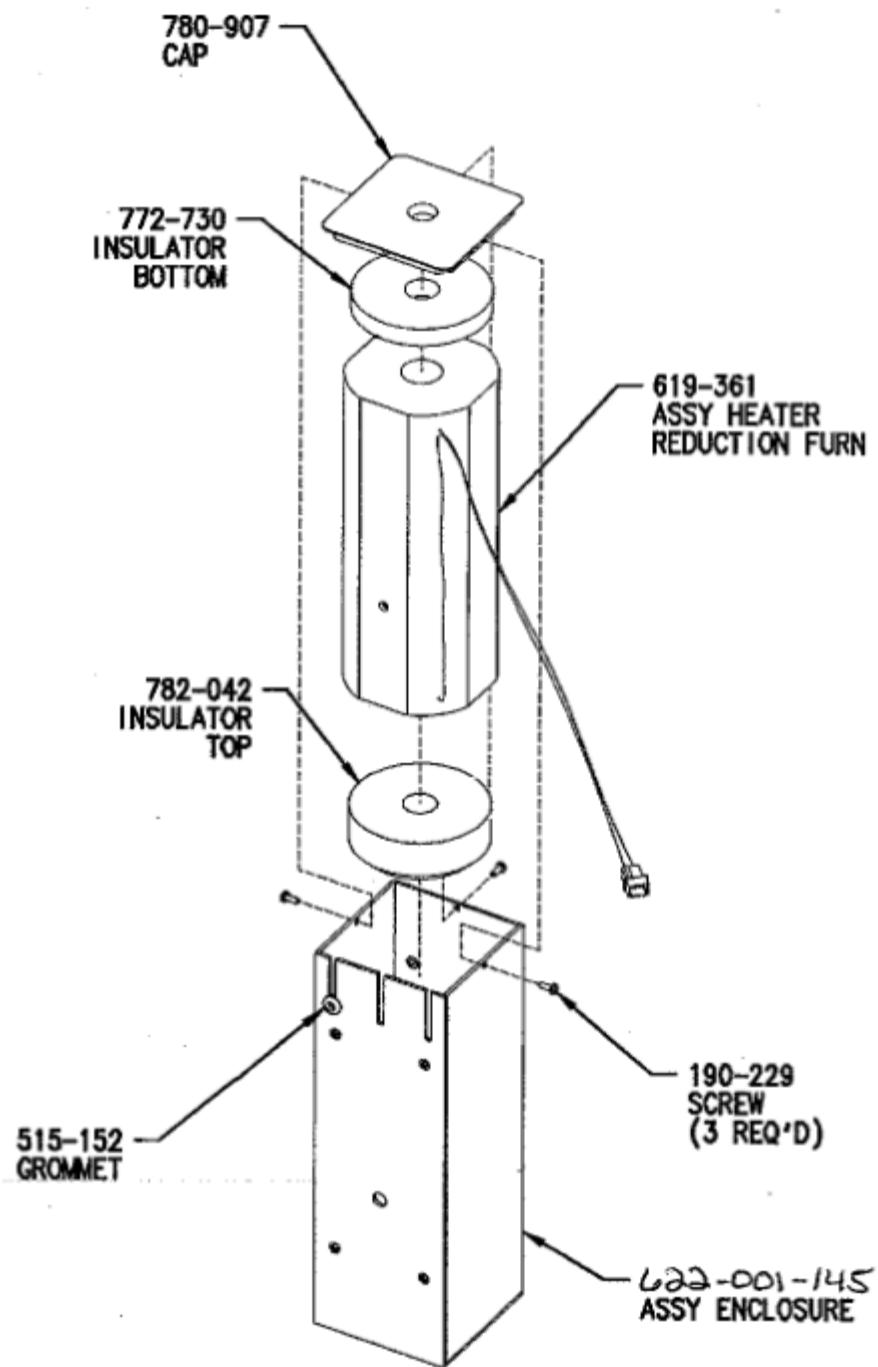
ILS-00417-000

Figure 10-6
Oven Fan Assembly



ILS-00319-C

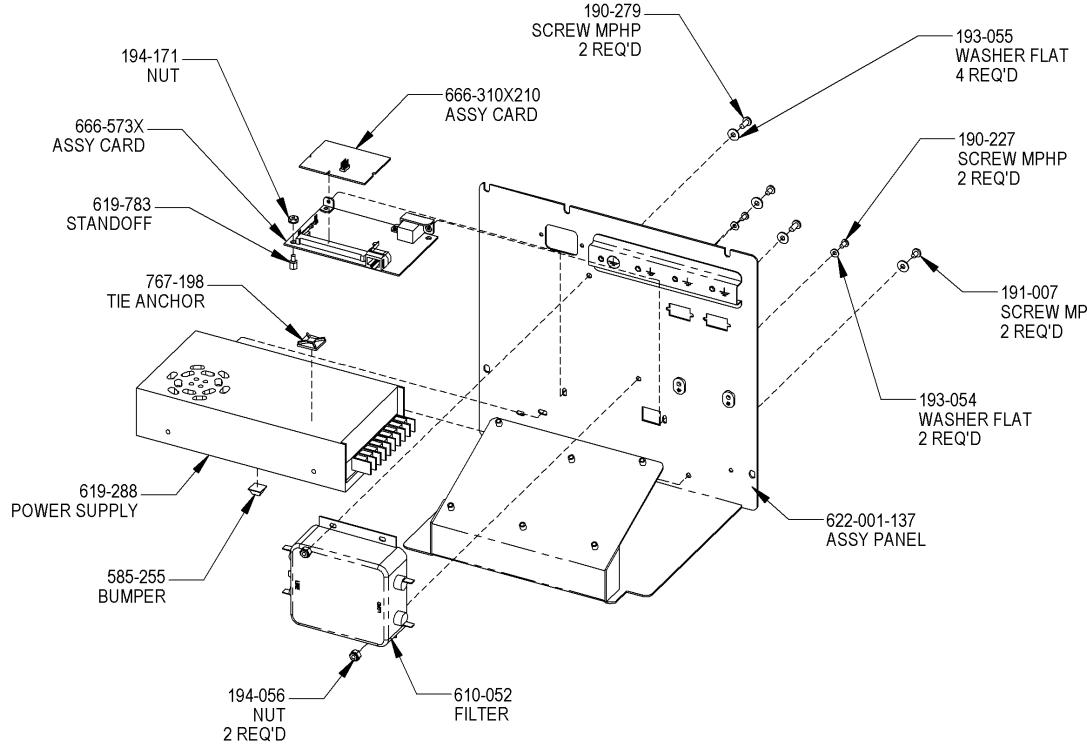
Figure 10-7
Incoming Gas Filter Assembly



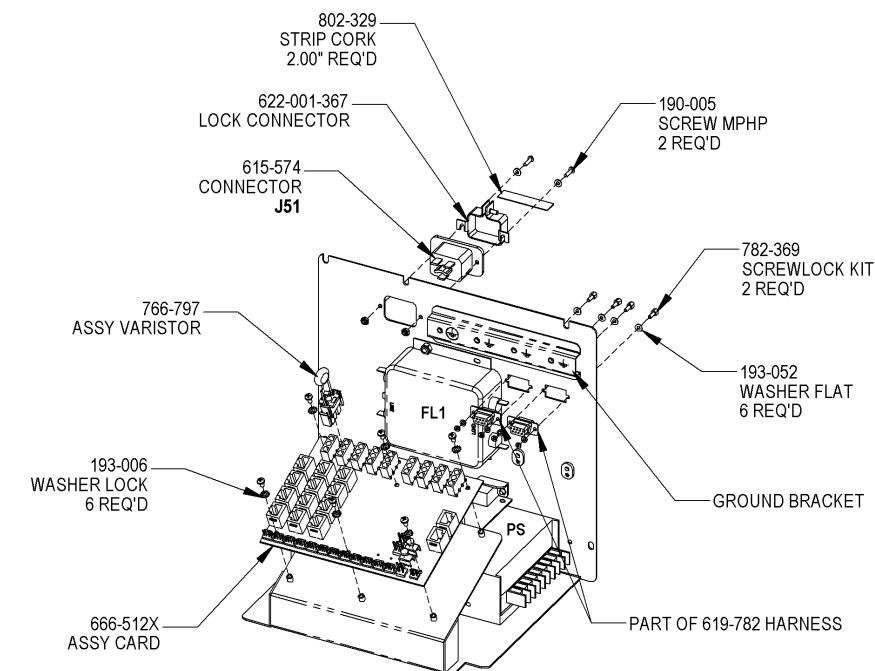
ORIGINAL

ILS-00325-C

Figure 10-8
Reduction Heater Assembly



X = ASSY CARD REVISION AS INDICATED BY WORK ORDER OR KIT COMPONENT

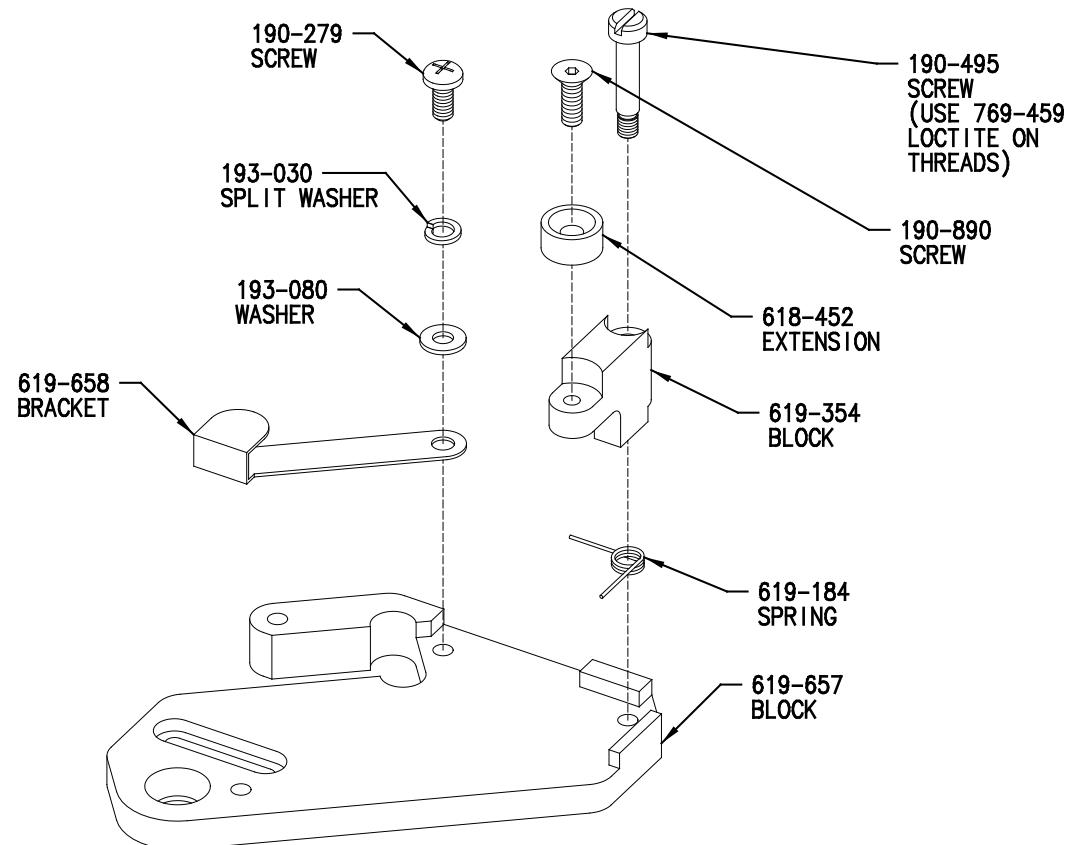


NOT SHOWN:

(4) 193-008 LOCK WASHER, AND (4) 190-227 SCREW MPH P.
THE SCREWS AND WASHERS GO INTO THE GROUND BRACKET.

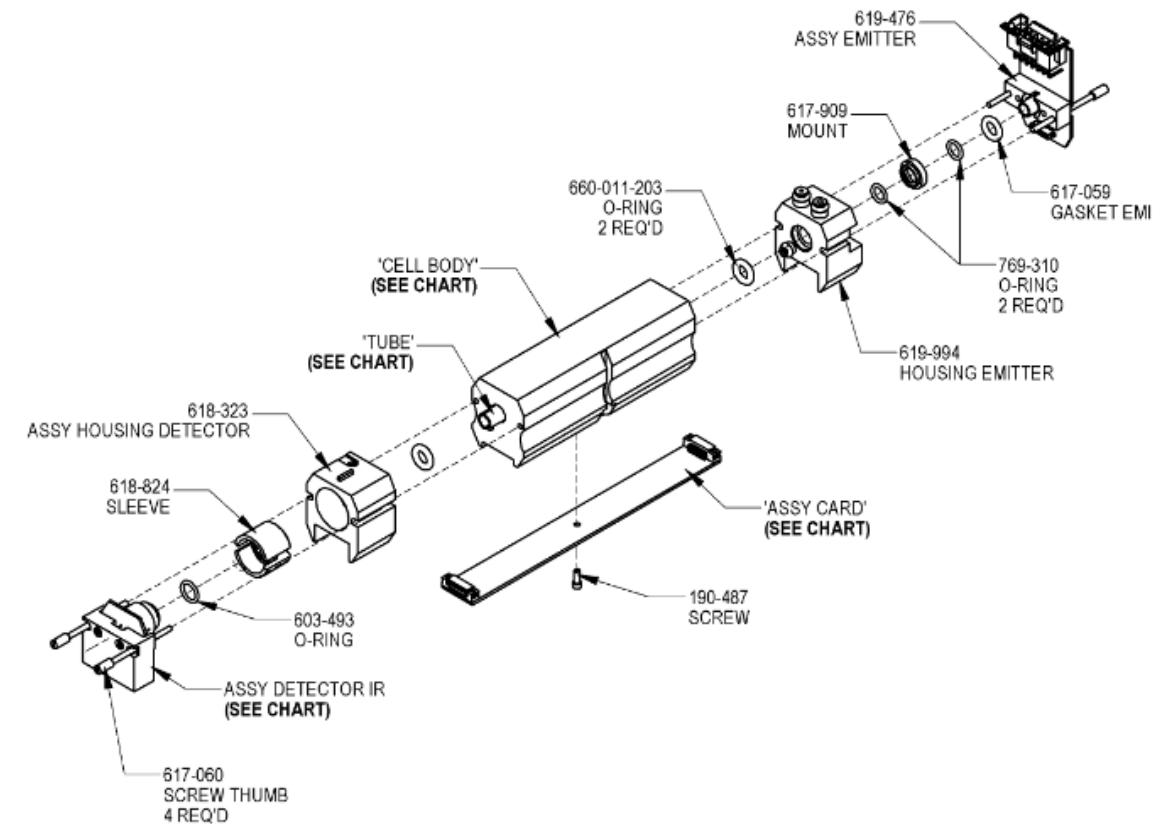
619-744-ILS-K

**Figure 10-9
AC Power Distribution Assembly**



ILS-00310-002

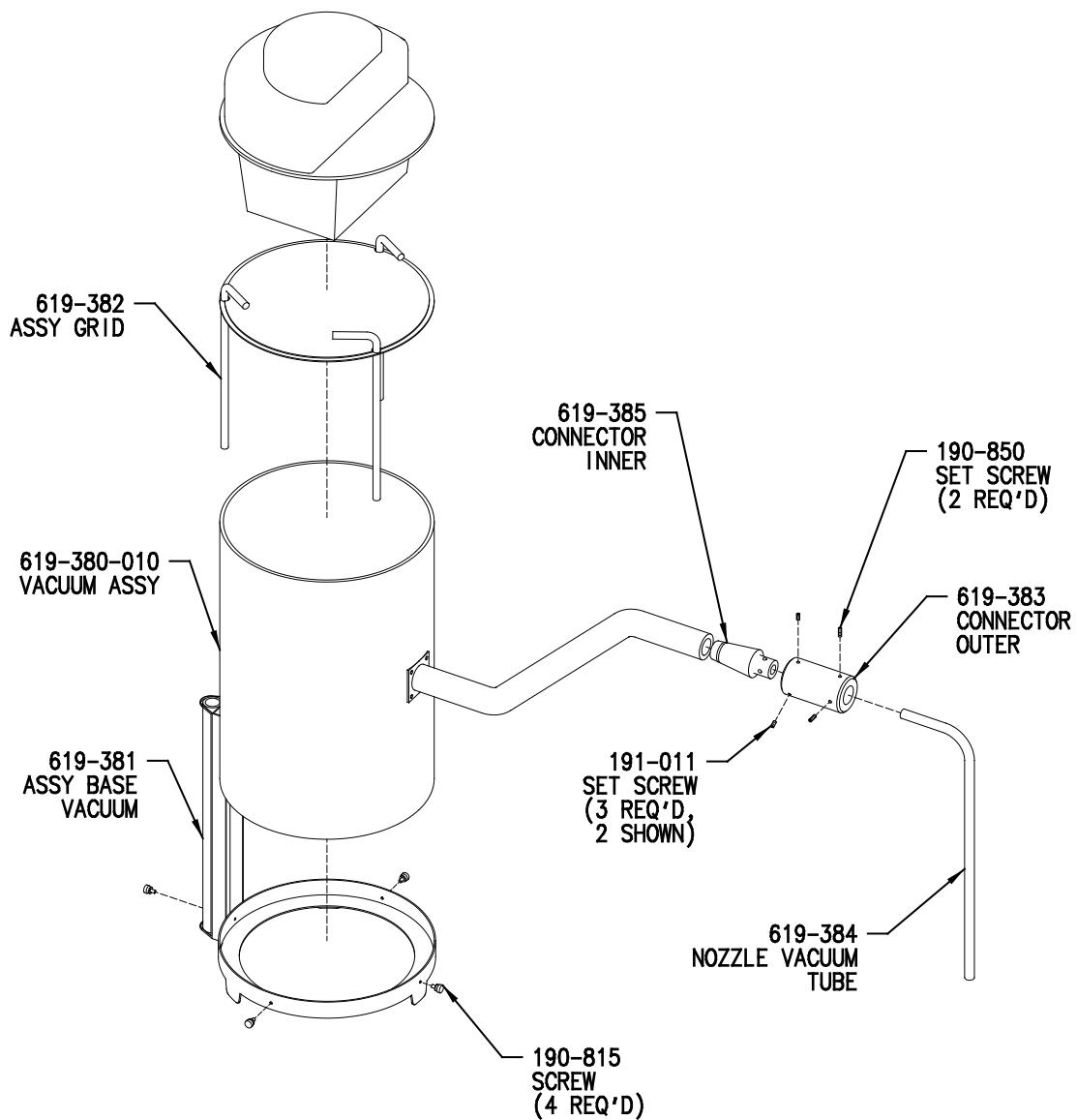
Figure 10-10
Slide Block Adapter Assembly



ILS-00071-T

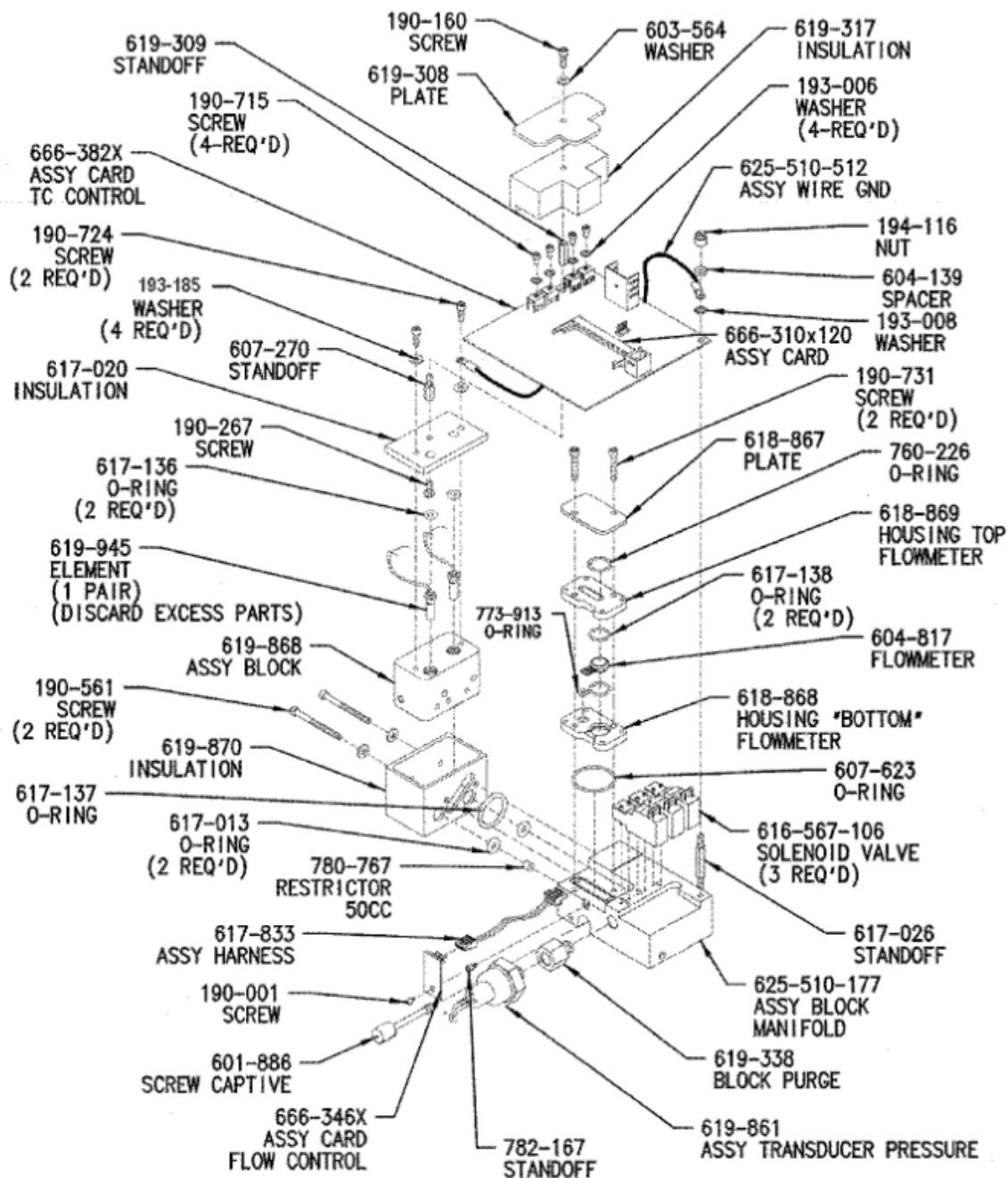
Figure 10-11
IR Cell Assembly

ASSY CELL P/N	ASSY CONE DETECTOR	CELL BODY	TUBE	ASSY CARD	CELL TYPE	CELL LENGTH	INSTRUMENT
617-092	618-320	618-307	617-807	666-260	H ₂ O	6.00"	RH600, ROH600, TCH600, TRUSPEC CHN
618-842	618-318	618-839	617-806	666-259	CO	2.75"	ROH600, TCH600, RO400, RO500, RO600, TC600



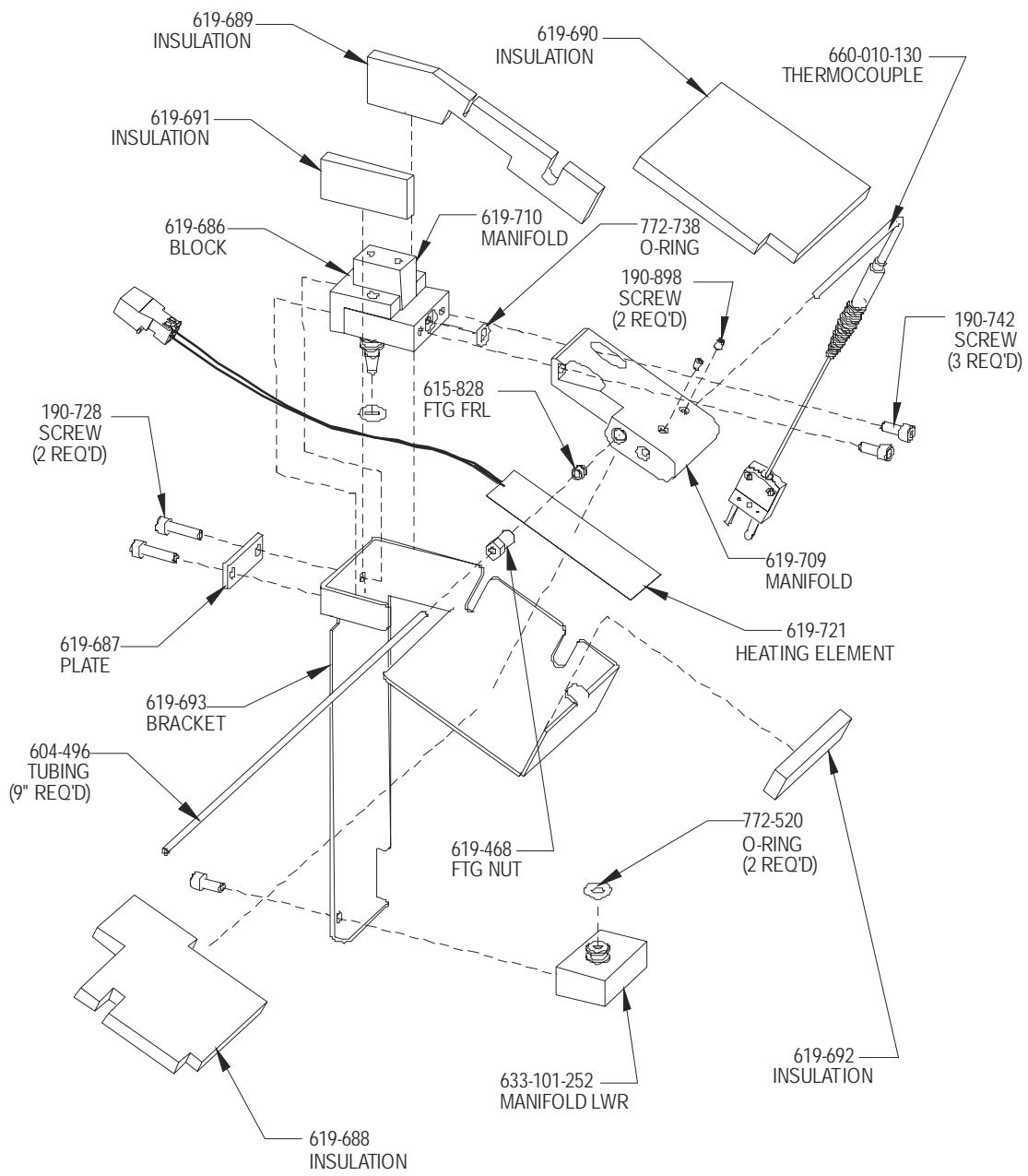
ILS-00340-000

Figure 10-12
Vacuum Assembly



ILS-00328-P

Figure 10-13
TC Cell Assembly



ILS-00610-A

Figure 10-14
Heater Bracket Assembly

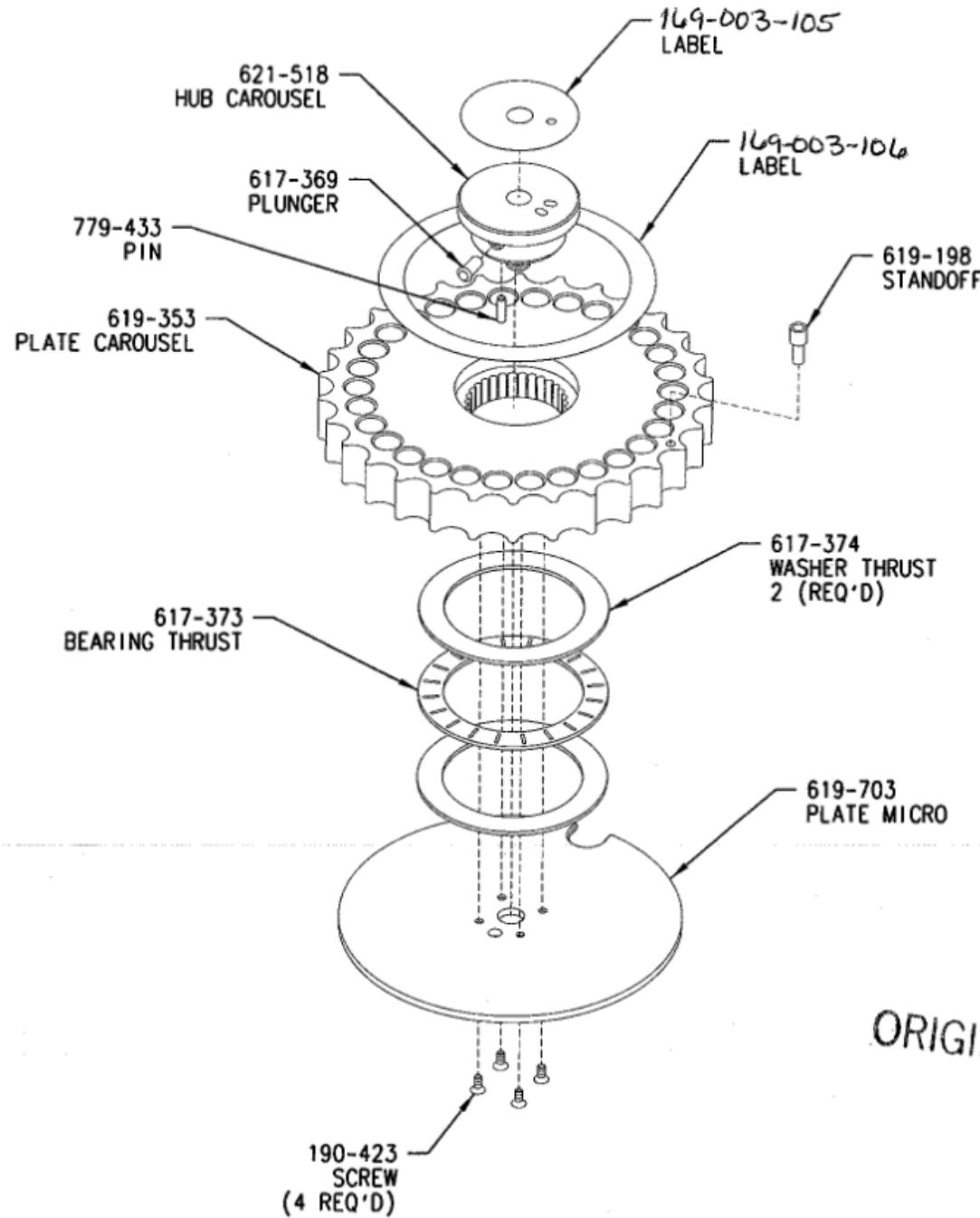
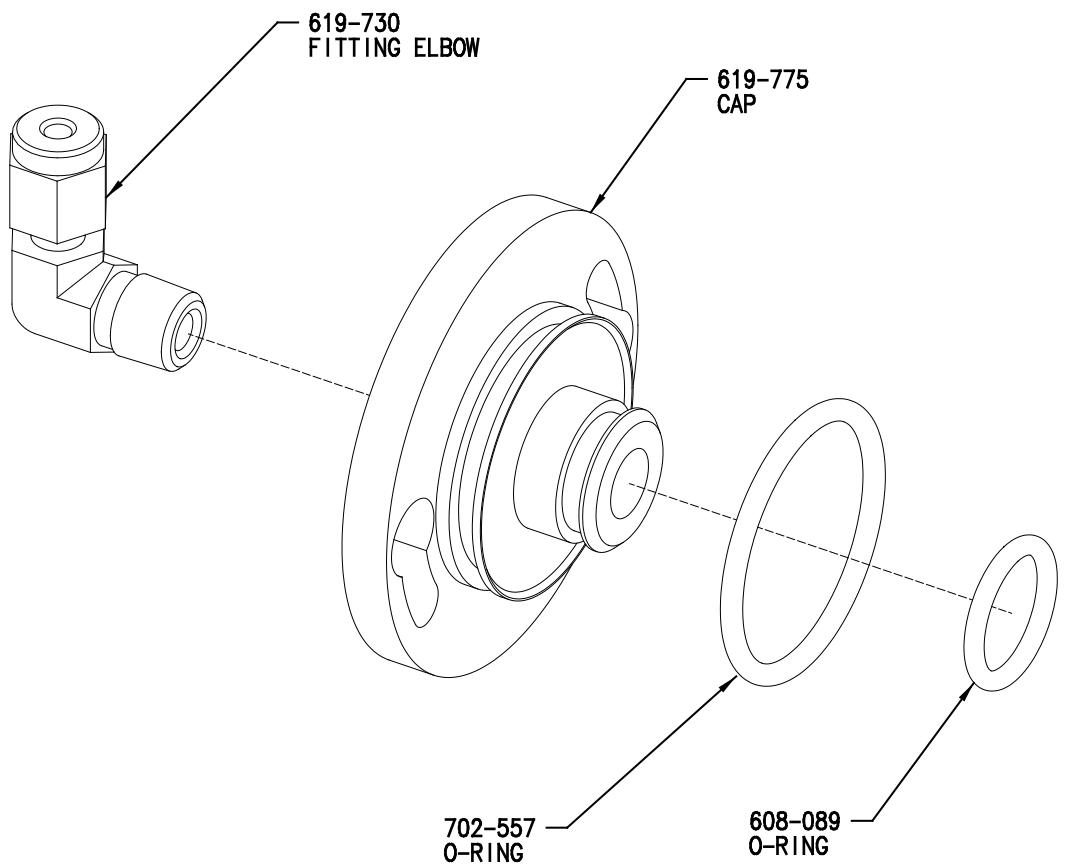


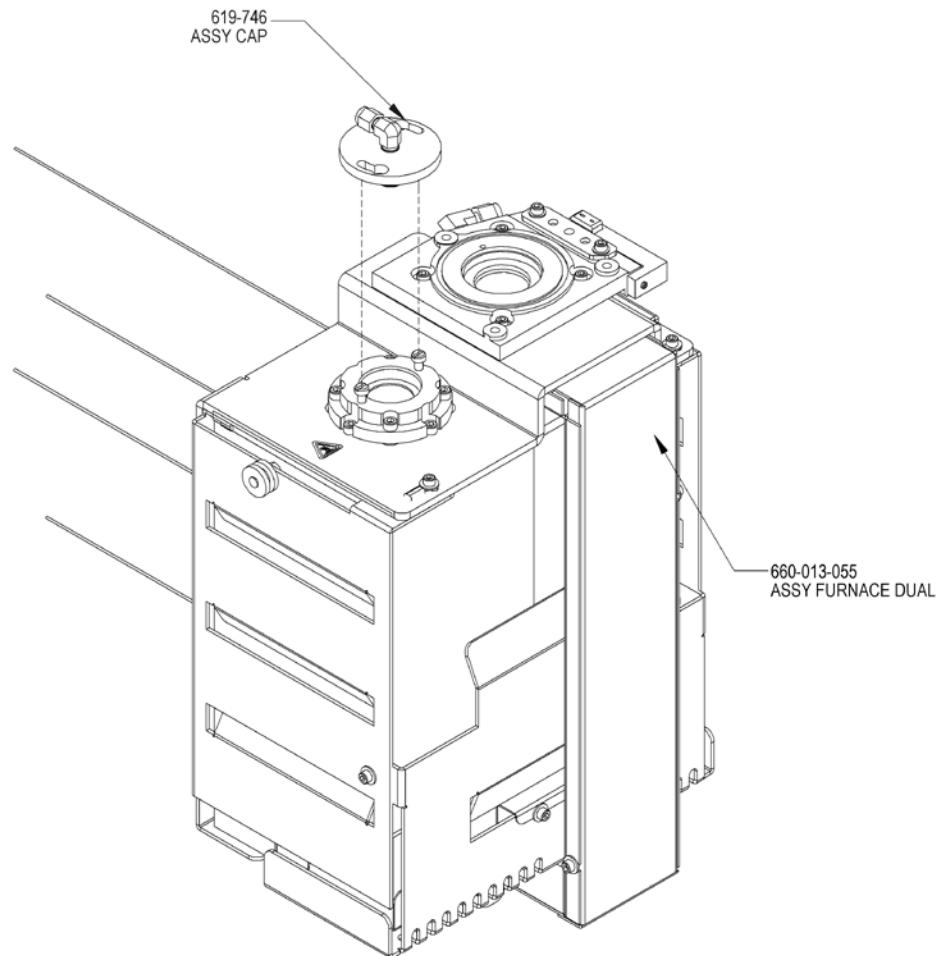
Figure 10-15
Micro Carousel Assembly

ILS-00419-B



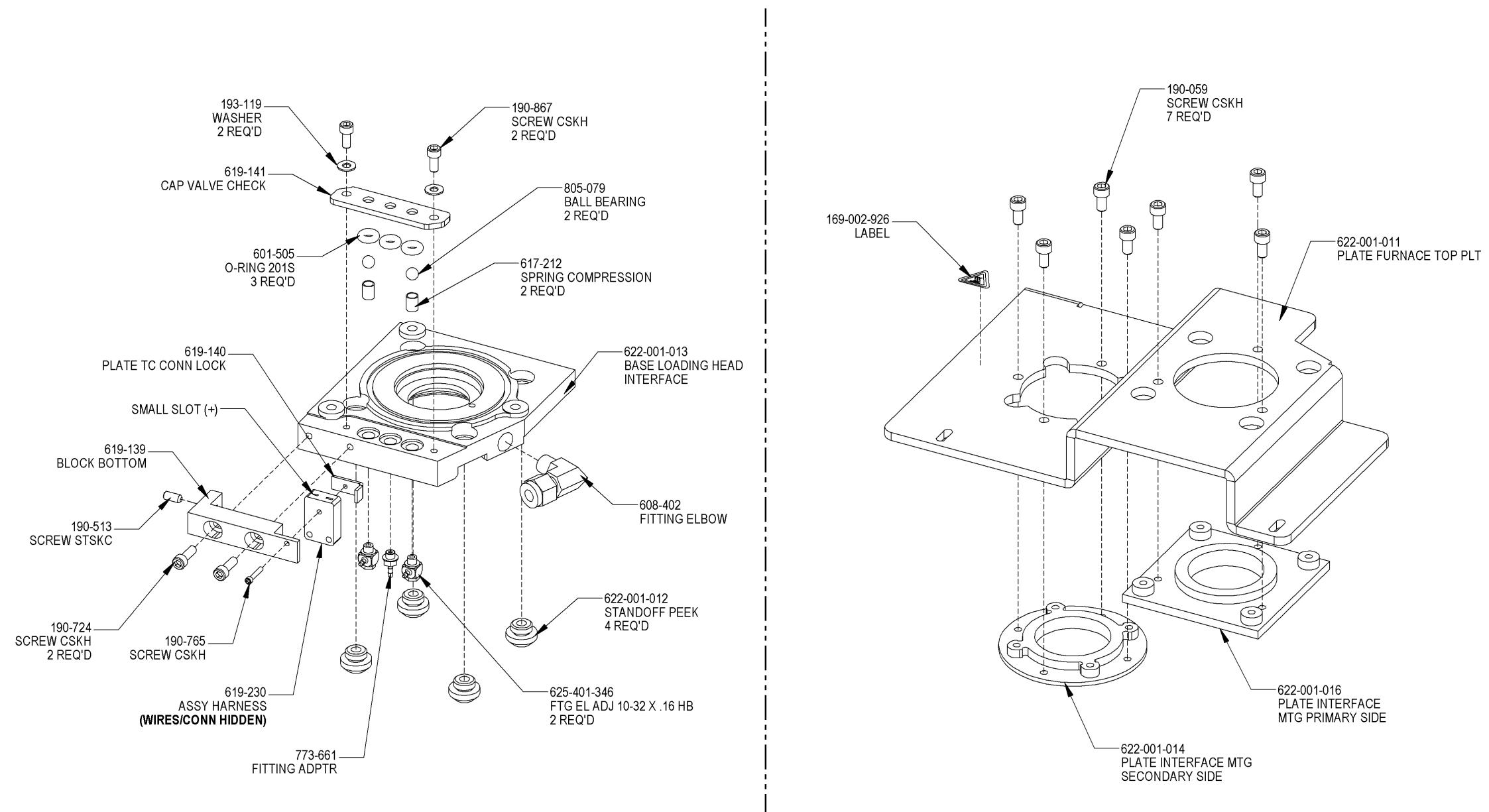
ILS-00480-000

Figure 10-16
Combustion Tube Cap



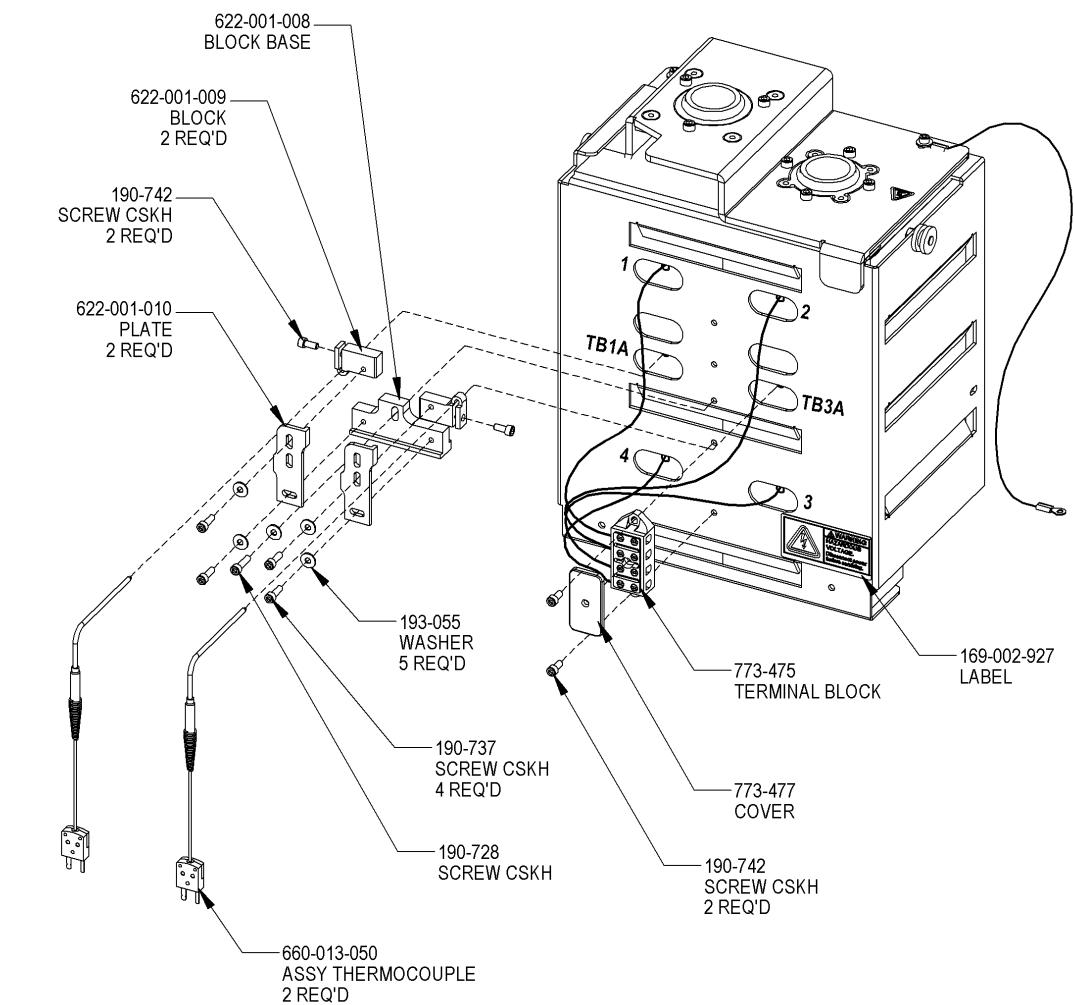
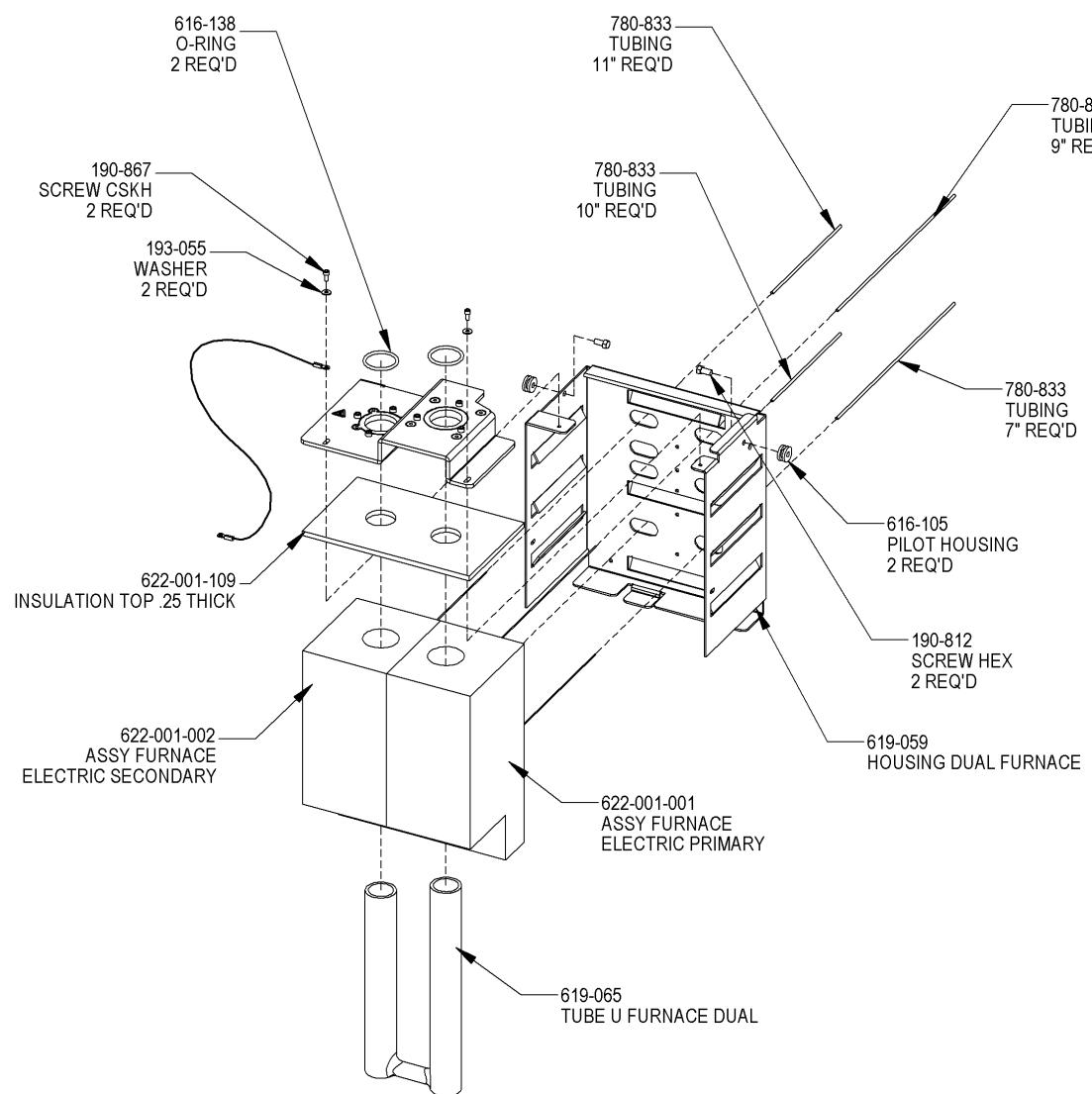
660-013-056-ILS - B

Figure 10-17
Dual Furnace w/Cap Micro Assembly



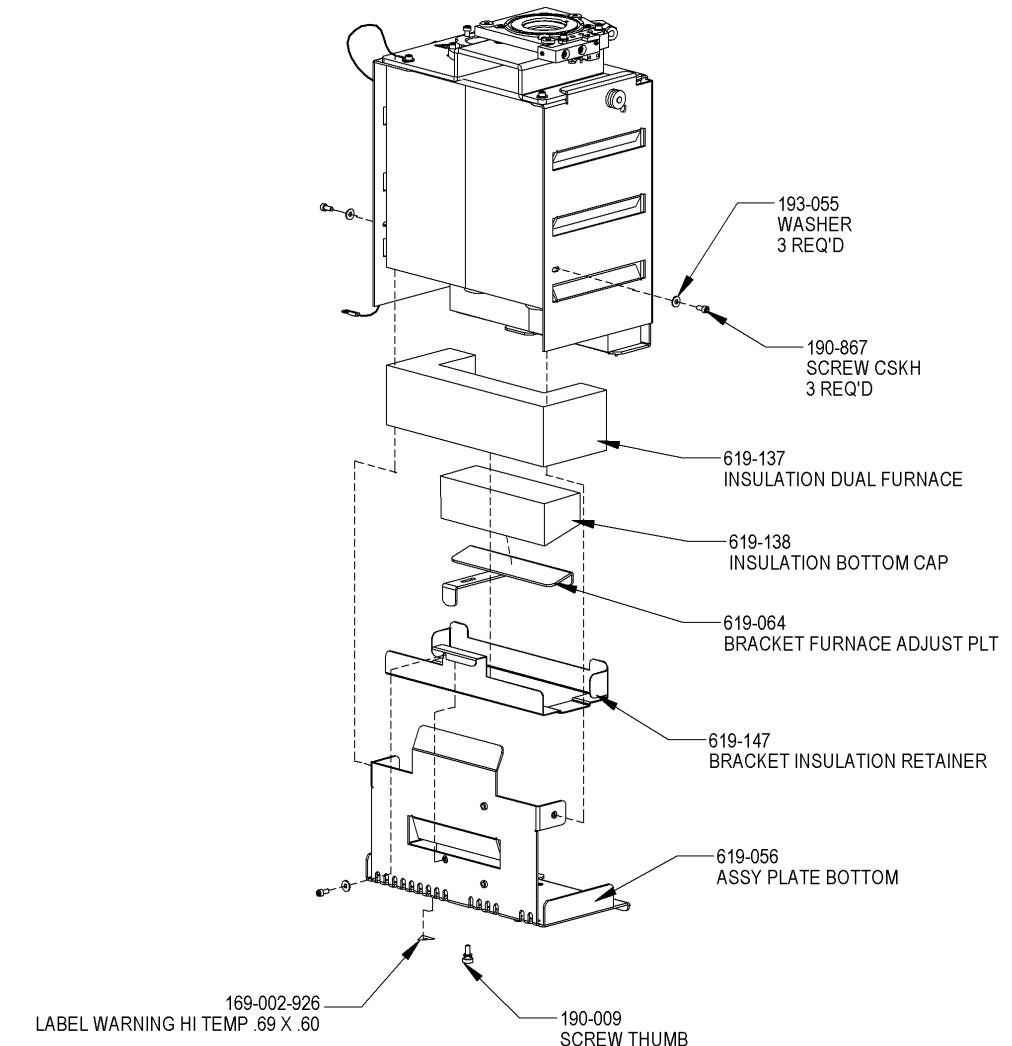
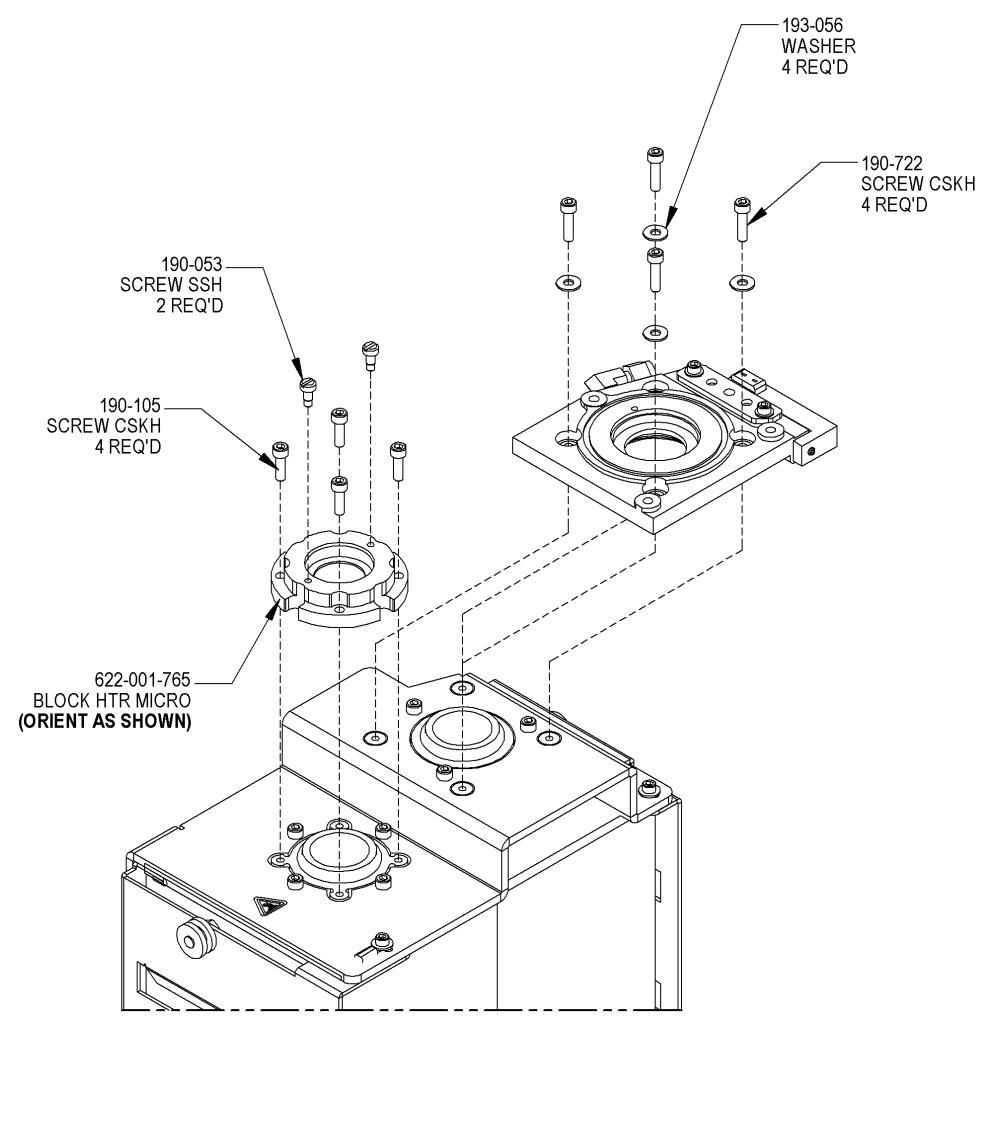
660-013-055-ILS-A
SHEET 1 OF 4

Figure 10-18
Dual Furnace Assembly 1 of 4



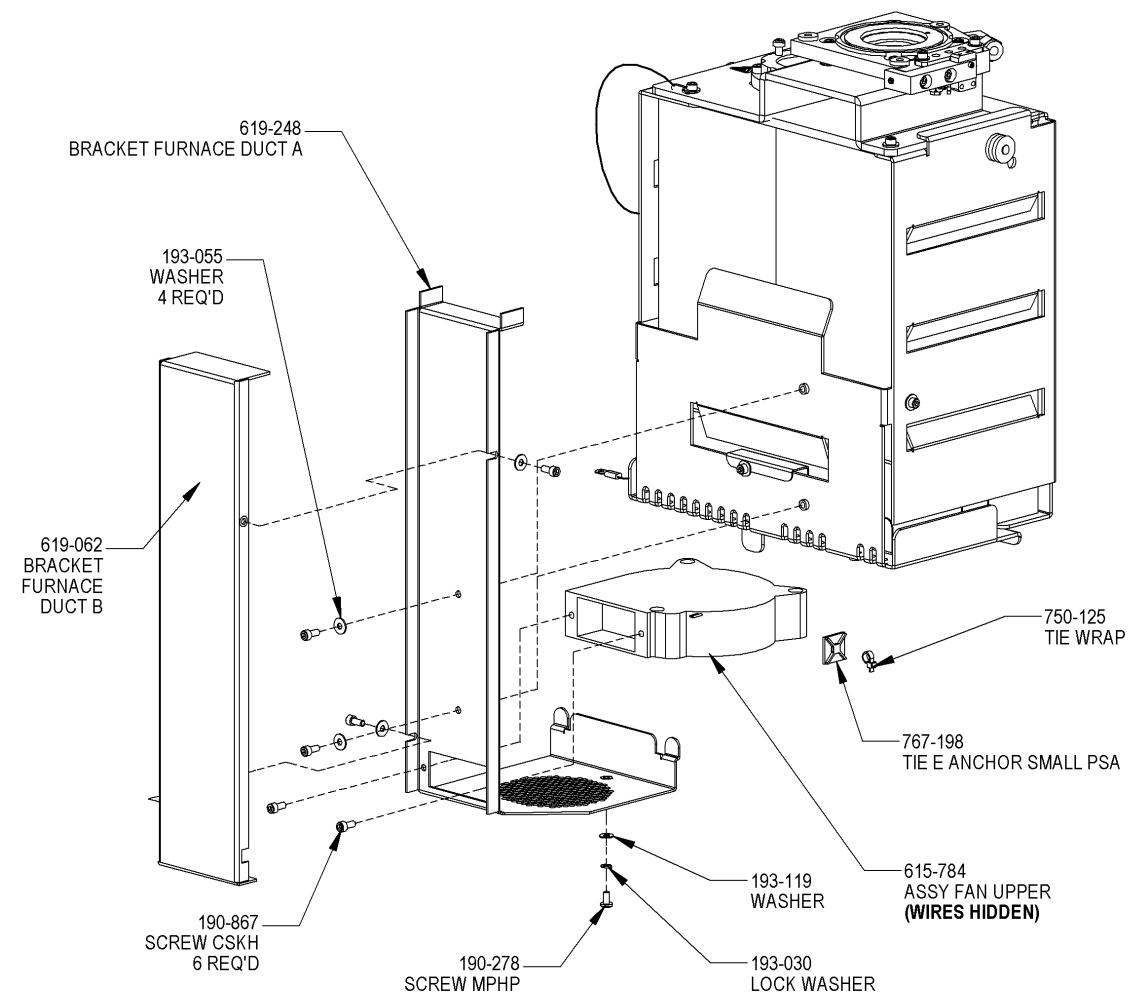
660-013-055-ILS-A
SHEET 2 OF 4

Figure 10-19
Dual Furnace Assembly 2 of 4



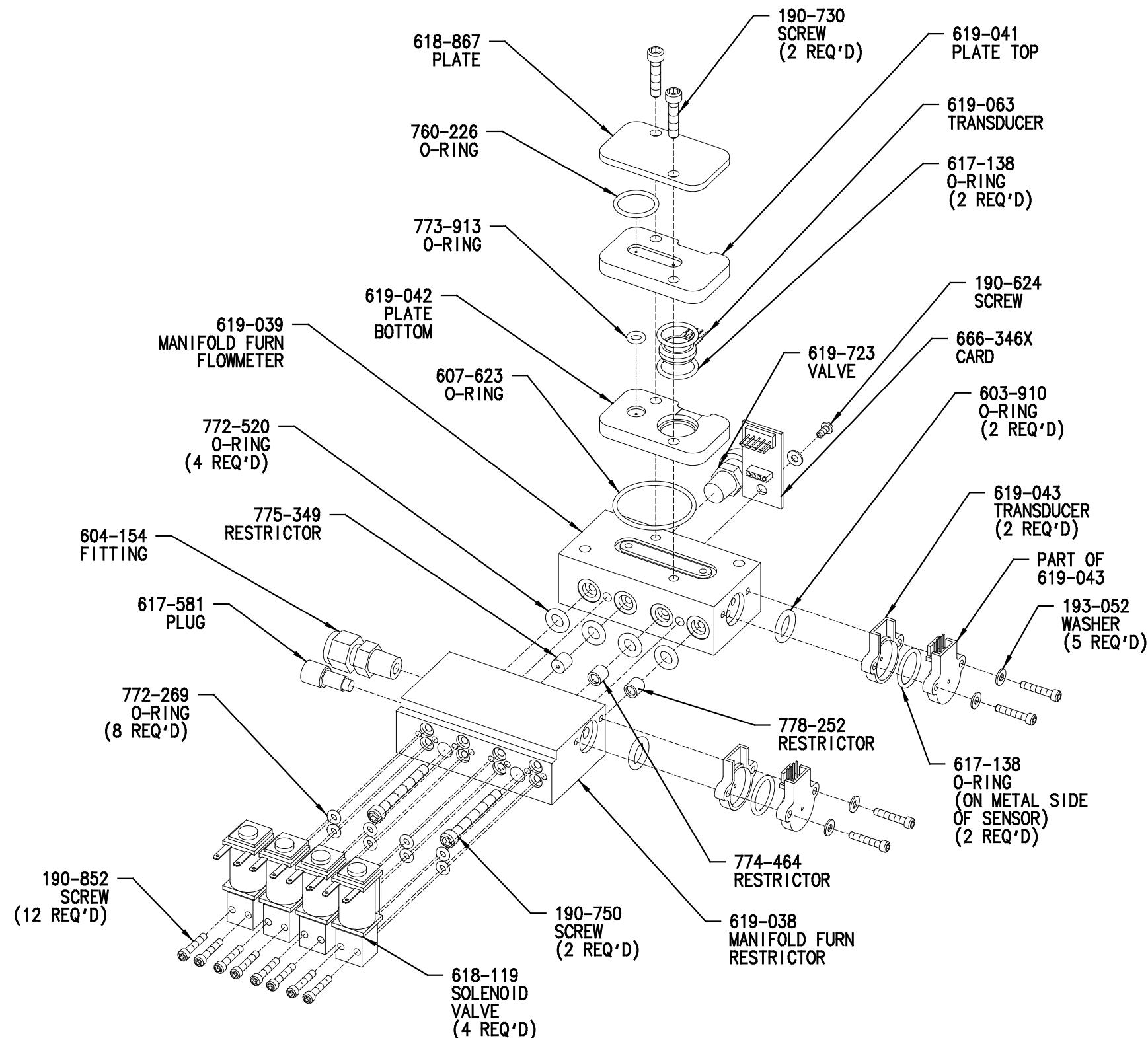
660-013-055-ILS-A
SHEET 3 OF 4

Figure 10-20
Dual Furnace Assembly 3 of 4



660-013-055-ILS - A
SHEET 4 OF 4

Figure 10-21
Dual Furnace Assembly 4 of 4



ILS-00321-002

Figure 10-22
Furnace Manifold Assembly

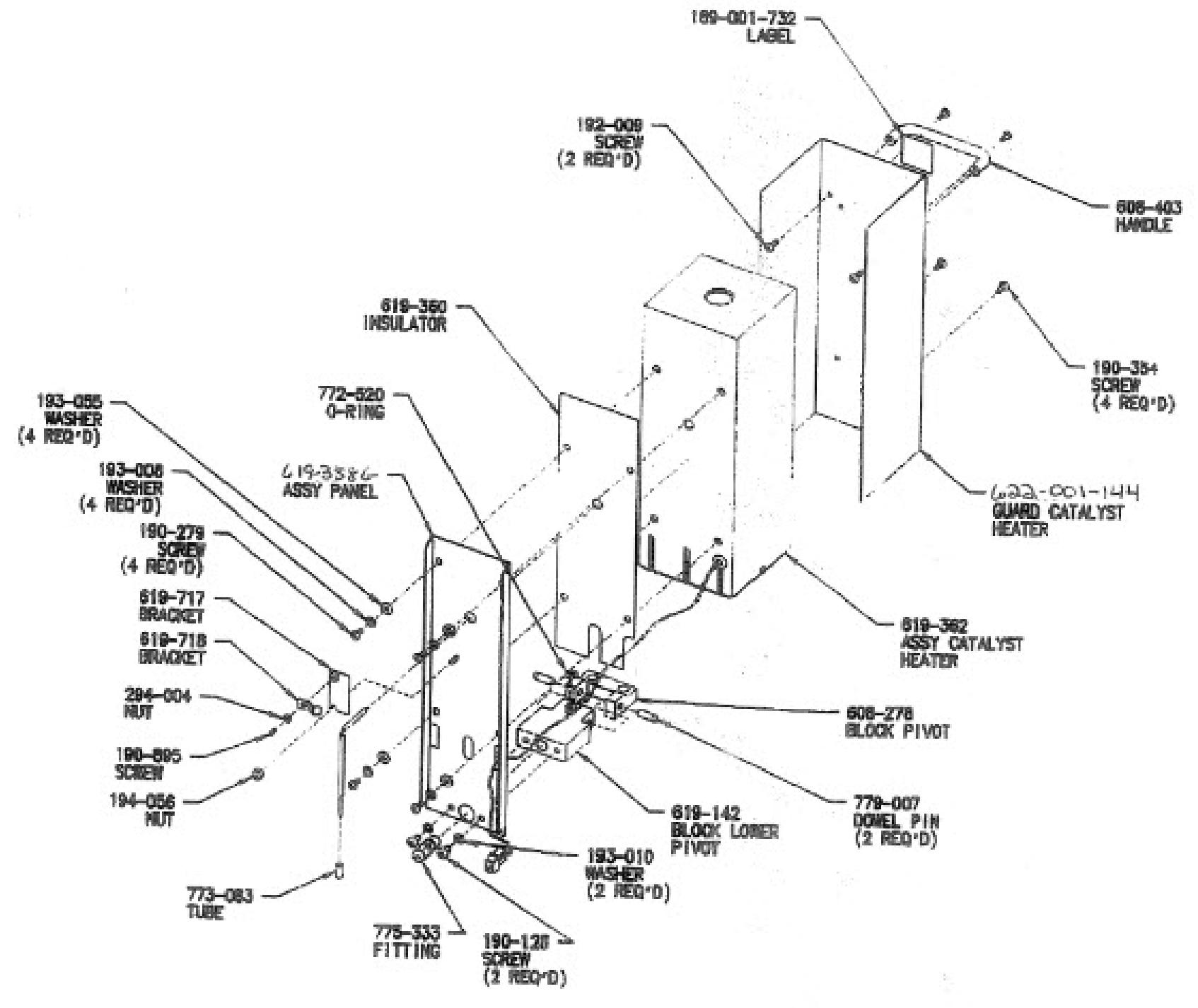
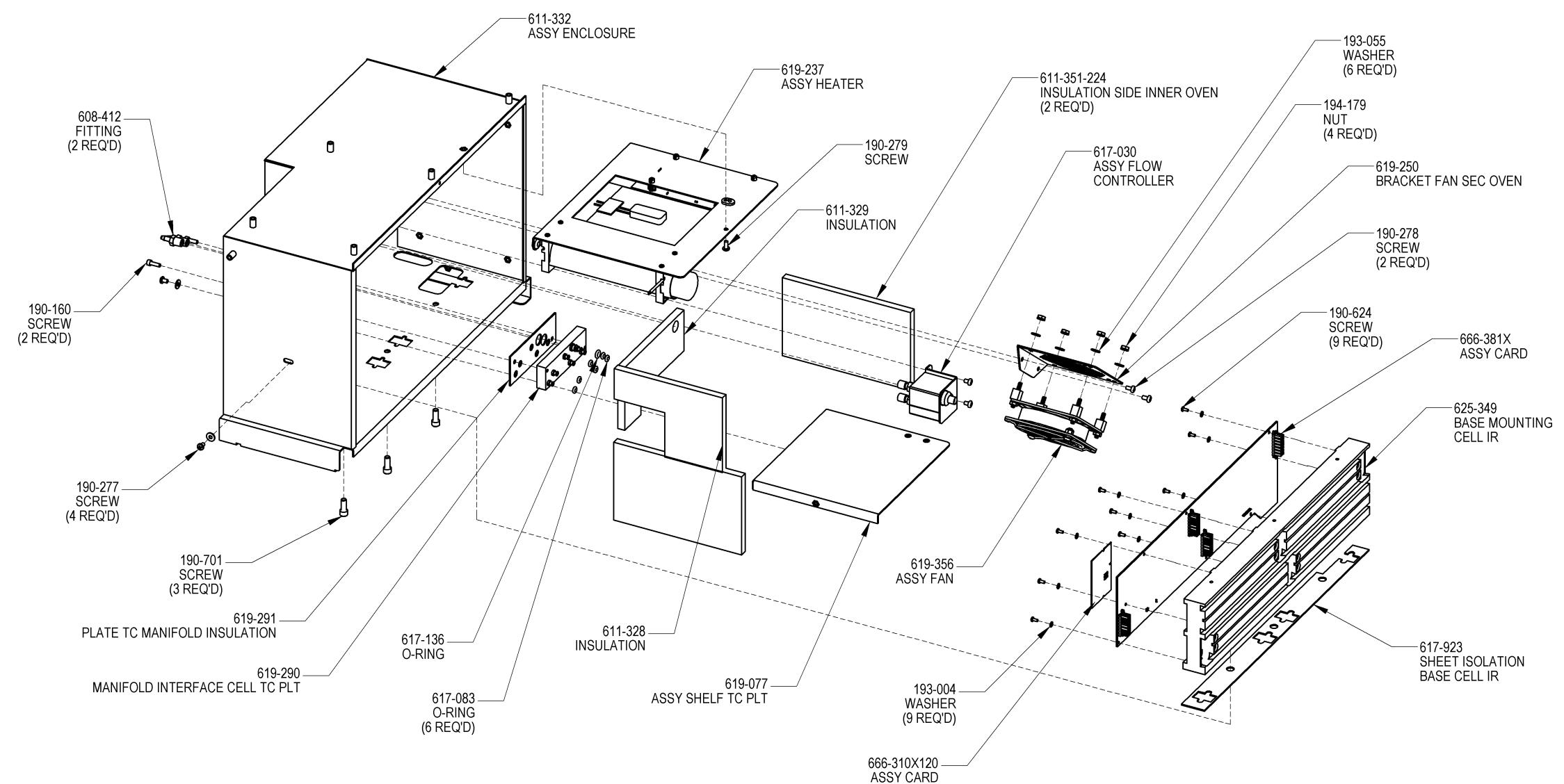
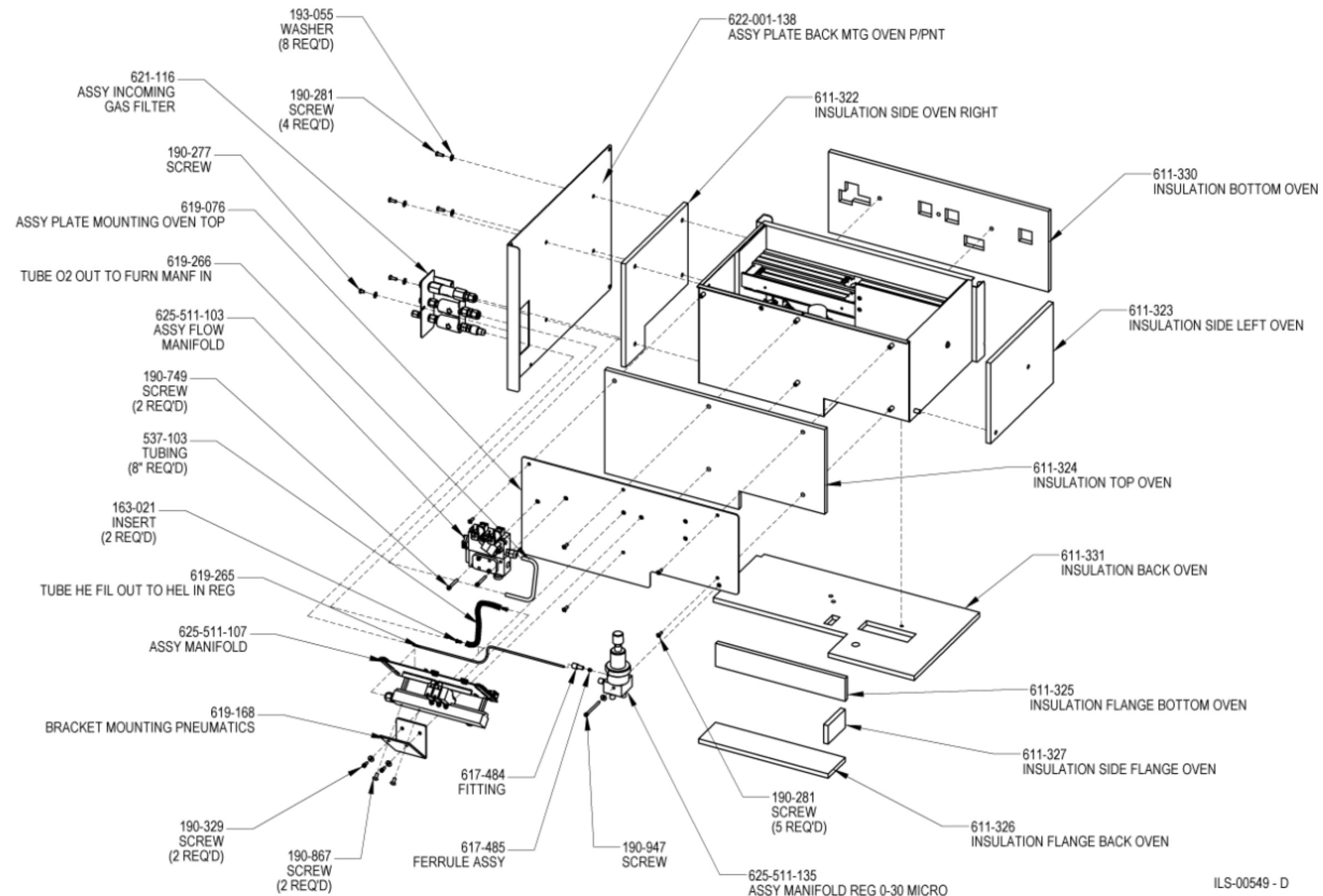


Figure 10-23
Reduction Heater Panel



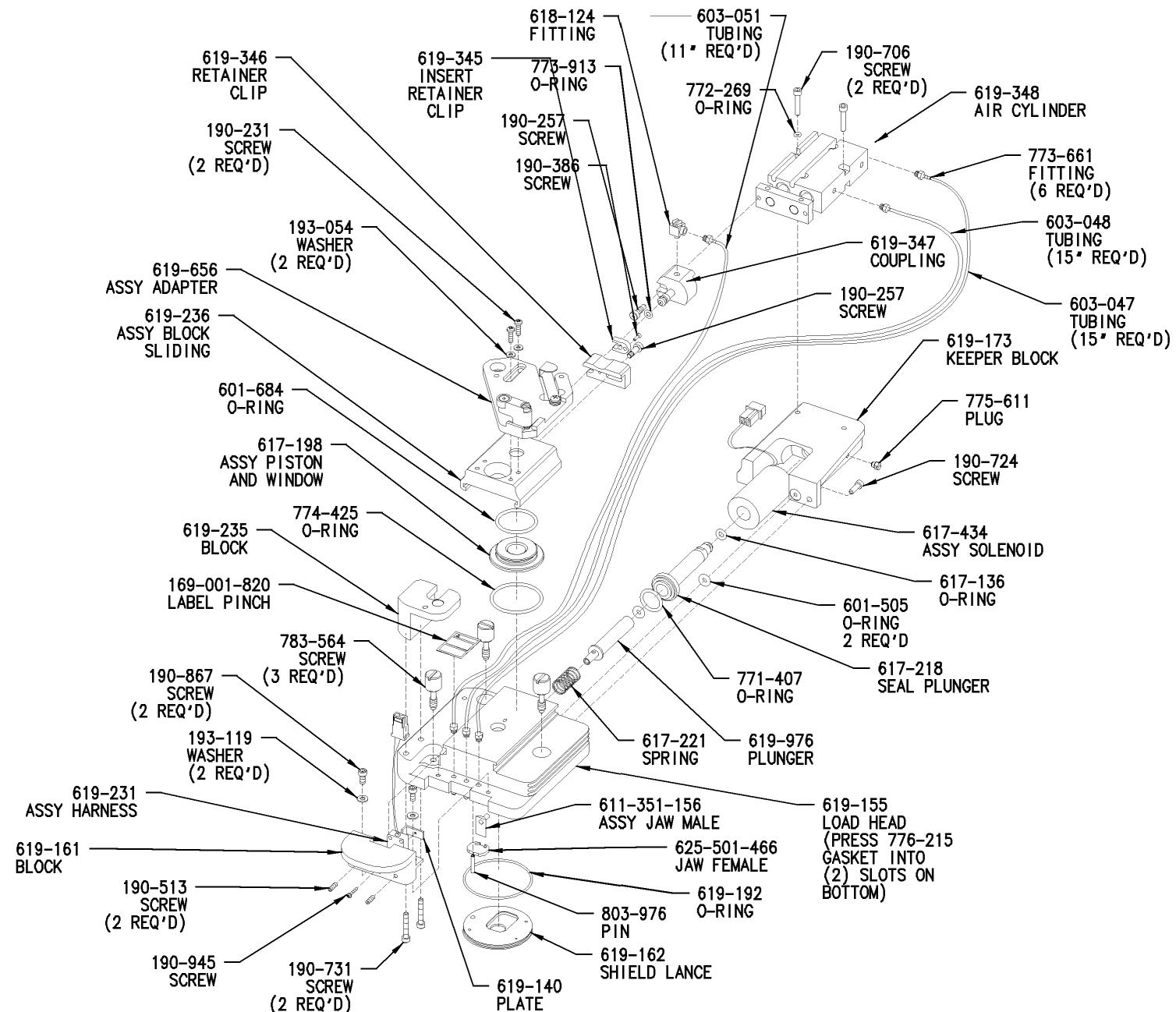
ILS-00549 - D

Figure 10-24
Cell Oven Assembly Sheet 1



ILS-00549 - D

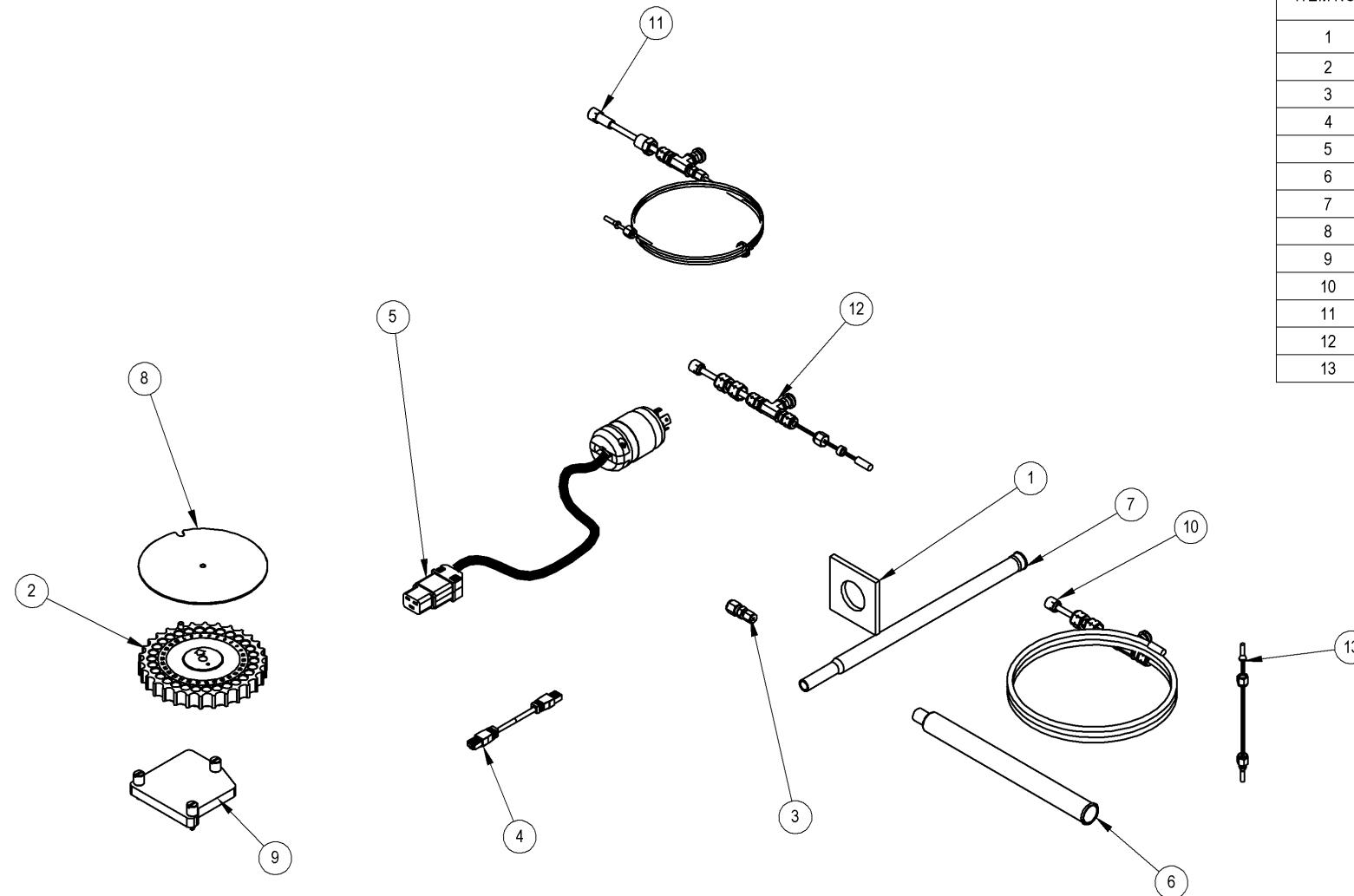
Figure 10-25
Cell Oven Assembly Sheet 2



ILS-00327-G

Figure 10-26
Loading Head Assembly

630-210-070 PACK COMPONENT TRUSPEC MICRO



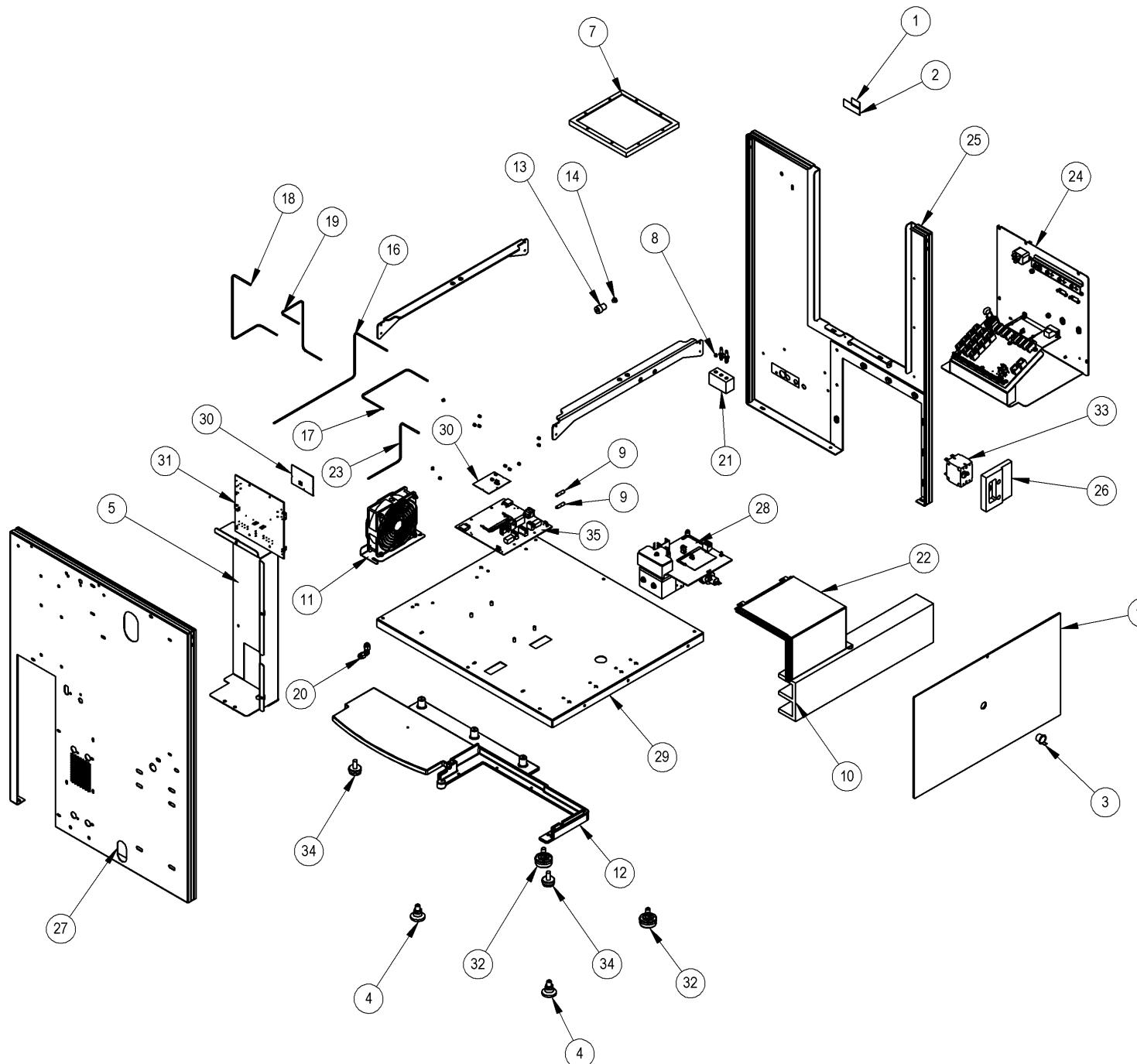
ITEM NO.	PART NUMBER	DESCRIPTION	QUANTITY
1	616-103	INSULATOR BOARD-COMBUSTION TUBE	1
2	619-704	ASSY CAROUSEL MICRO STACK 30	1
3	782-526	FTG UNION SS .12T-.25T	1
4	620-677	CABLE ASSY CAT 5 SHIELDED RJ45 15'	1
5	615-426	ASSY POWER CORD 10FT	1
6	617-548	TUBE BOROS FILTER 1.0 X 11.39	1
7	619-154	TUBE CATALYST HEATER	1
8	619-304	ASSY COVER DUST CAROUSEL	1
9	619-377	ASSY PLATE BYPASS	1
10	762-458	ASSY CONNR NUT 9/16-18/.25CU T	1
11	775-303	ASSY CONNECTOR W/RELIEF HELIUM	1
12	780-485	ASSY CONNECTOR N2	1
13	780-844	ASSY HOSE VESSEL PRESSURE	1

ILS-00648-A

**Figure 10-27
Exploded View 1**

630-110-020 ASSY TRUSPEC COMMON SUB SHEET 1

ITEM NO.	PART NUMBER	DESCRIPTION	QUANTITY
1	169-001-730	LABEL ID CE	1
2	169-002-499	LABEL ID C-TICK	1
3	516-011	CAP PRTV C .610/.695 PLE L/T	1
4	606-259	ASSY PAD LEVELING SLIDE	2
5	611-341G	ASSY WALL LOWER OVEN SEC P/PNT	1
6	611-996	FTG ADPTR TZ .187T -1/4-28	2
7	614-704	FILTER AIR 6.00 x 7.00 x .47	1
8	617-485	FERRULE W/ SST LOCKRING .12T TEFZEL	14
9	617-565	PIN MOUNTING IR SST	2
10	617-570	INSULATION COVER IR CELL	1
11	619-003	ASSY FAN MOUNTED	1
12	619-005G	CASTING BASE FRONT ENCLOS MACH	1
13	619-044	FTG NUT RND .25T PK 1/2-20 BLK	1
14	619-045	FTG FRL EFTF .25T	1
15	619-070	COVER ENCL OVEN FRONT	1
16	619-205	TUBE SEC REA OUT/BOT-FC I	1
17	619-207	TUBE TC#6 MAN TO FC BOT	1
18	619-210	TUBE HE REG IN TO TC #4 MAN	1
19	619-211	TUBE HE OUT REG BLOCK - TC#5 MAN	1
20	619-243	FTG EL 90 SS .12T-.12T	1
21	619-246	ASSY MANIFOLD EXHAUST	1
22	619-339	ASSY COVER CELL TC TRUSPEC	1
23	619-620	TUBE TC#7 TO SCR OUT BOT	1
24	619-744	ASSY POWER SUPPLY DISTR AC	1
25	622-001-136	ASSY PANEL BACK P/PNT	1
26	622-001-324	BOX SHADOW CB 12 AMP	1
27	622-001-744	ASSY PANEL INNER FRONT	1
28	625-401-349	ASSY MODULE CELL TC	1
29	660-010-146	ASSY BASE TRU-SPEC	1
30	666-310X120	ASSY CARD PGM NI SERVER SGL B	2
31	666-514X140	ASSY CARD SM ECL DUAL HTR V4	1
32	780-970	FOOT LEVELING .375-16X .625	2
33	789-320	CIRCUIT BRK 15 A 250V DPST PO	1
34	801-491	LEVELER FOOT	2
35	666-514X190	ASSY CARD SM ECL DUAL HTR V8 INST 1	1



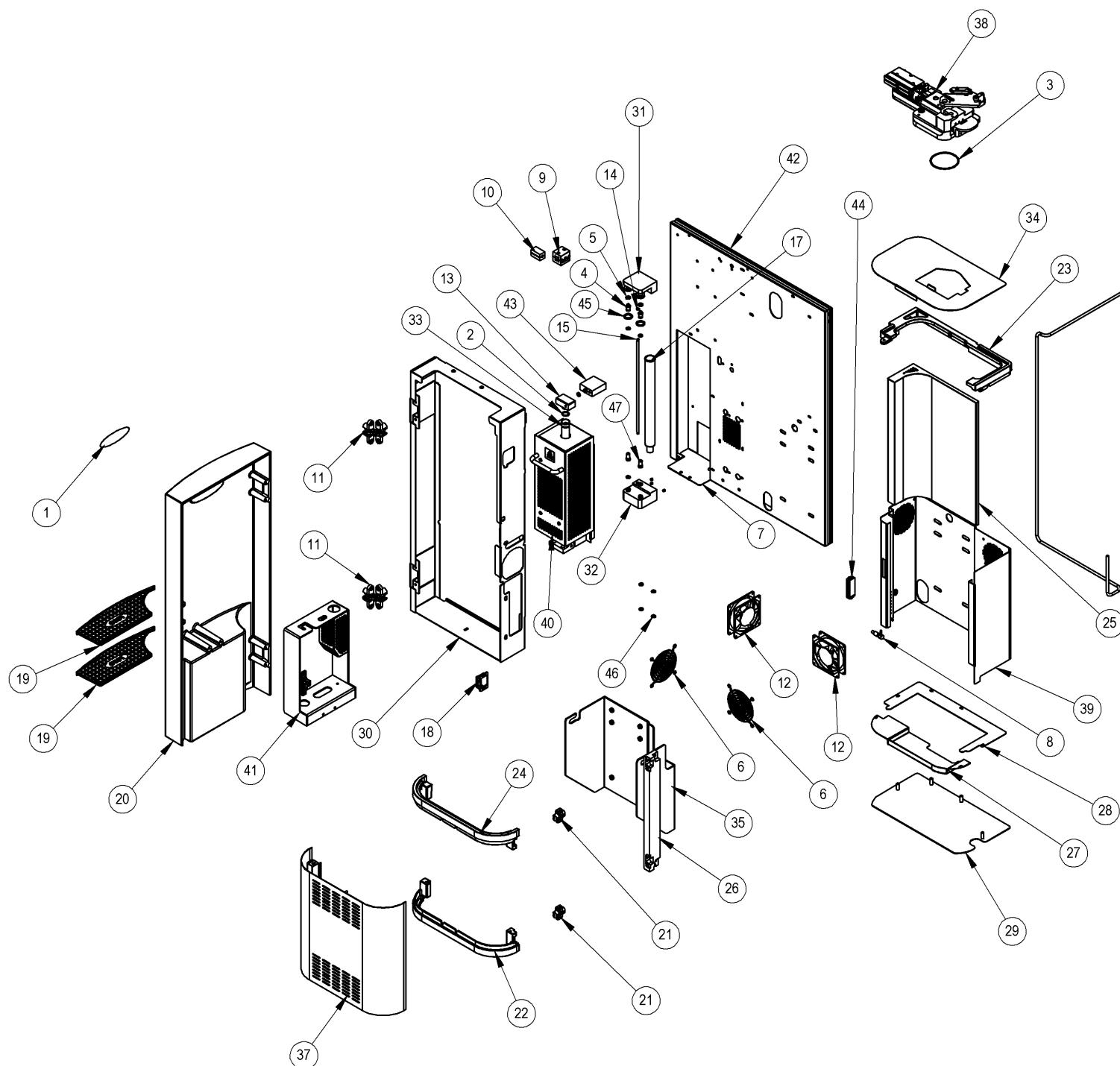
630-110-020-ILS-L

**Figure 10-28
Exploded View 2**

630-110-020 ASSY COMMON SUB SHEET 2

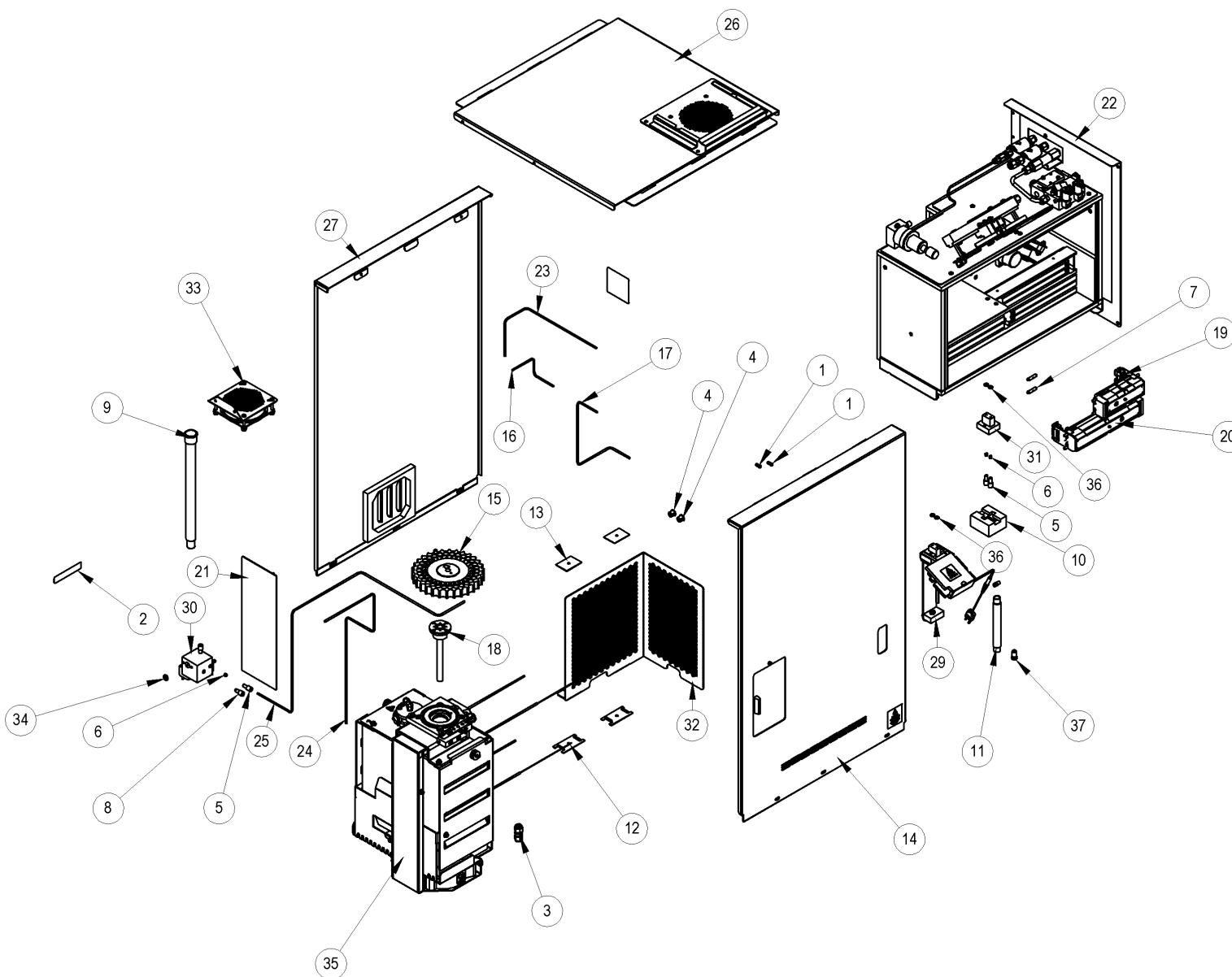
ITEM NO.	PART NUMBER	DESCRIPTION	QUANTITY
1	169-003-135	LABEL ELLIPTICAL LECO 1.28 X 4.10	1
2	601-442	O-RING 113 .549X .755X.103V	1
3	601-504	O-RING 147 2.675X 2.881X.103V	1
4	605-795	STEM QUICK DISCONNECT TUBE	2
5	605-797	WASHER FLT W/SEAL	2
6	605-826	GUARD - FINGER FAN	2
7	611-341G	ASSY WALL LOWER OVEN SEC P/PNT	1
8	615-525	PLUNGER SPRING LCK .375-16	1
9	615-639	BEAD FERRITE SPL 1.28 X .51	1
10	615-640	BEAD SNAP-ON FERRITE SERIAL	1
11	615-958	HINGE CONCEALED DOOR CHROME	2
12	616-140	ASSY FAN AND CONNECTOR	2
13	616-145	BLOCK REMOVABLE CAT HTR	1
14	617-083	O-RING 104 .112X .318X.103V	2
15	617-171	TUBE INTERCONNECT SST	1
16	617-485	FERRULE W/ SST LOCKRING .12T TEFZEL	3
17	617-548	TUBE BOROS FILTER 1.0 X 11.39	1
18	617-713	CATCH ASSY DOOR NON-MAGNETIC	1
19	617-819	PAD SHELF FOAM DOOR FRONT	2
20	617-836G	DOOR FRONT TC 600 MACH	1
21	617-875	HINGE CONCEALED DOOR SLOTTED	2
22	619-006G	CASTING TRIM FRONT BOT P/PNT	1
23	619-007G	CASTING TRIM TOP BACK P/PNT	1
24	619-008G	CASTING TRIM FRONT TOP P/PNT	1
25	619-057G	ASSY SHROUD FRONT DECORATIVE	1
26	619-058	BAR MOUNTING HINGE	1
27	619-068G	ASSY FLOOR PAN C	1
28	619-071	PAN FLOOR A PLT	1
29	619-087G	ASSY PLATE FURN BAFFLE PNT	1
30	619-111G	ASSY FRAME FRONT P/PNT	1
31	619-148	ASSY BLOCK REAGENTS UPPER PLT	1
32	619-149	BLOCK REAGENTS LOWER	1
33	619-154	TUBE CATALYST HEATER	1
34	619-167	PLATE COVER TOP	1
35	619-169	BRACKET ASSY FURNACE	1
36	619-264	TUBE FURN FLOW CONN TO LOAD HEAD	1
37	619-311G	ASSY SHROUD FRONT P/PNT	1
38	619-349	ASSY LOADING HEAD	1
39	619-694G	ASSY SHROUD SIDE	1
40	619-719	ASSY PANEL HEATER CATALYST	1
41	619-733G	ASSY HOLDER TOOL W/GUARD	1
42	622-001-744	ASSY PANEL INNER FRONT	1
43	625-511-114	BLOCK STATIONARY CAT HTR	1
44	703-041	CATCH MAGNET SNAP-IN LARGE	1
45	765-976	O-RING 208 .609X .887X.139V	2
46	772-520	O-RING 108 .237X .443X.103V	9
47	775-306	FILTER SECONDARY 10MICRON	2

630-110-020-ILS-L



**Figure 10-29
Exploded View 3**

630-210-010 ASSY TRUSPEC CHN MICRO UNIQUE

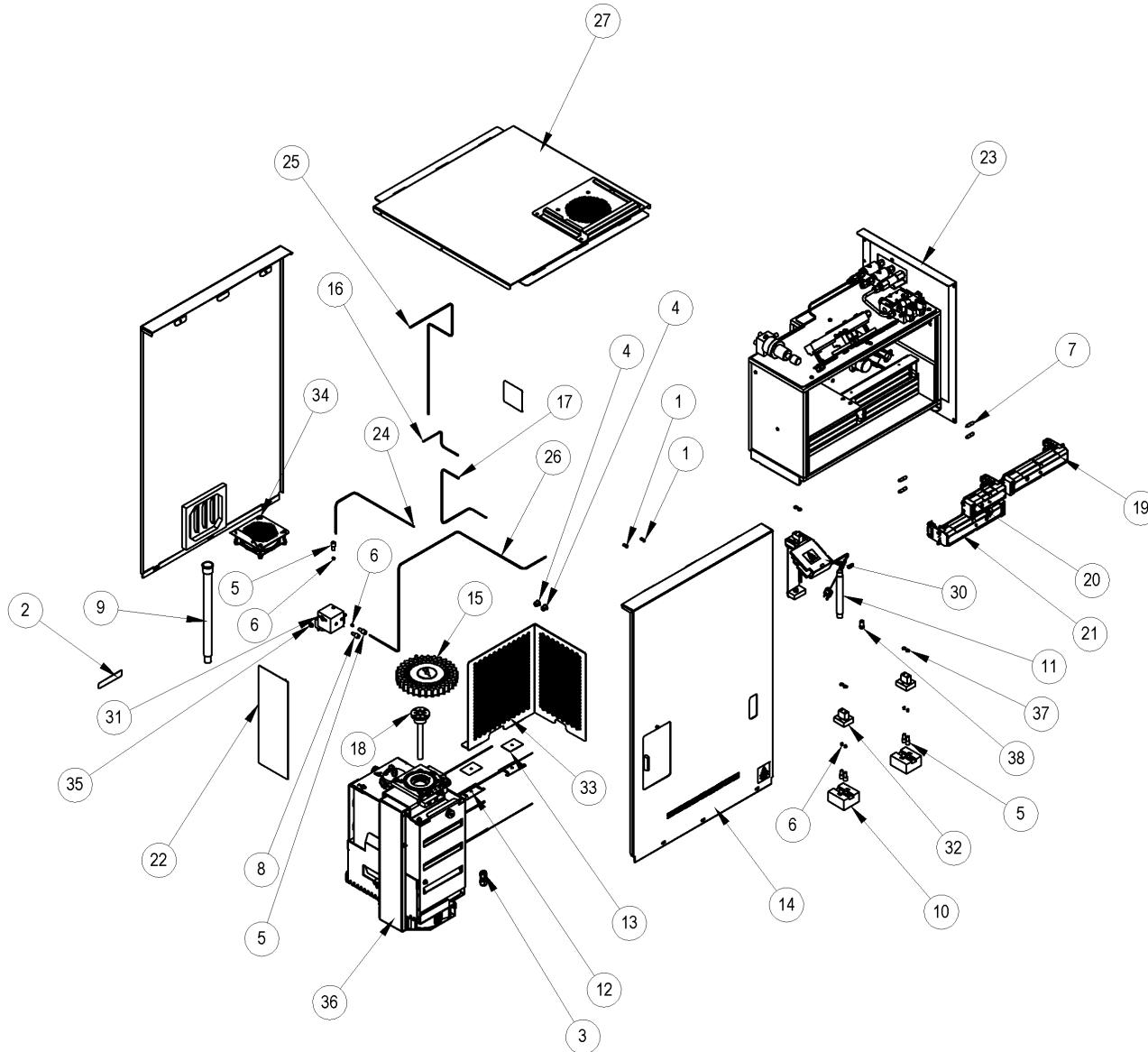


ITEM NO.	PART NUMBER	DESCRIPTION	QUANTITY
1	163-020	FTG INSERT SS .250TP-.187ID	2
2	169-003-107	LABEL ID TRUSPEC MICRO	1
3	589-185	FTG UNION BR .25T - .25T	1
4	614-934	PLUG BUTTON .437 DIA BLK PL	2
5	617-484	FTG NUT .12T - 1/4-28 DELRIN	4
6	617-485	FERRULE W/ SST LOCKRING .12T TEFZEL	4
7	617-565	PIN MOUNTING IR SST	2
8	617-581	FTG PLUG DEL .250-.28 FLG LESS	1
9	618-809	TUBE BOROSILICATE FILTER .63 X 11.40	1
10	619-397	INSULATION CAP	1
11	619-425	TUBE GLASS STRAIGHT FILTER	1
12	619-617	ASSY COVER BASE	2
13	619-618	PLATE COVER	2
14	619-697	ASSY PANEL RIGHT SIDE W/DOOR	1
15	619-704	ASSY CAROUSEL MICRO STACK 30	1
16	619-731	TUBE INCOM SCRIB TO HE OUT REG	1
17	619-732	TUBE TC MAN #4 TO HELIUM IN	1
18	619-784	ASSY LANCE & HOLDER	1
19	625-386	ASSY CELL IR CO2 2.75 LOW GAIN	1
20	625-509	ASSY CELL IR	1
21	625-511-112G	ASSY COVER PANEL FRONT	1
22	625-511-119	ASSY OVEN CELL MICRO	1
23	625-511-127	TUBE TC1 TO MANIFOLD DIVERTER	1
24	625-511-128	TUBE CAT OUT TO REAGENT IN	1
25	625-511-129	TUBE MAN DIVERTER TO MAN FLOW	1
26	625-511-134	ASSY PANEL TOP W/FAN MICRO	1
27	625-511-136	ASSY PANEL SIDE LEFT	1
28	625-511-140	NAMEPLATE ID TRUSPEC MICRO CHN	1
29	625-511-155	ASSY BLOCK HEATER MICRO DEDICATED	1
30	625-511-156	ASSY MANIFOLD DIVERTER MICRO	1
31	633-101-253	MANIFOLD INLET IR INTL PL	1
32	633-101-282	GUARD INTERIOR MICRO	1
33	660-010-132	ASSY FAN W/BRACKET	1
34	660-011-109	O-RING 109 .299 x .505 x .103EP	1
35	660-013-056	ASSY FURNACE DUAL W/CAP MICRO	1
36	772-738	O-RING 010 .239X .379X.070V	4
37	775-306	FILTER SECONDARY 10MICRON	1

630-210-010-ILS-E

**Figure 10-30
Exploded View 4**

630-220-010 ASSY TRUSPEC CHNS MICRO UNIQUE



ITEM NO.	PART NUMBER	DESCRIPTION	QUANTITY
1	163-020	FTG INSERT SS .250TP-.187ID	2
2	169-003-107	LABEL ID TRUSPEC MICRO	1
3	589-185	FTG UNION BR .25T - .25T	1
4	614-934	PLUG BUTTON .437 DIA BLK PL	2
5	617-484	FTG NUT .12T - 1/4-28 DELRIN	6
6	617-485	FERRULE W/ SST LOCKRING .12T TEFZEL	6
7	617-565	PIN MOUNTING IR SST	4
8	617-581	FTG PLUG DEL .250-.28 FLG LESS	1
9	618-809	TUBE BOROSILICATE FILTER .63 X 11.40	1
10	619-397	INSULATION CAP	2
11	619-425	TUBE GLASS STRAIGHT FILTER	1
12	619-617	ASSY COVER BASE	2
13	619-618	PLATE COVER	2
14	619-697	ASSY PANEL RIGHT SIDE W/DOOR	1
15	619-704	ASSY CAROUSEL MICRO STACK 30	1
16	619-731	TUBE INCOM SCRIB TO HE OUT REG	1
17	619-732	TUBE TC MAN #4 TO HELIUM IN	1
18	619-784	ASSY LANCE & HOLDER	1
19	625-345	ASSY CELL IR SO2 6.00	1
20	625-386	ASSY CELL IR CO2 2.75 LOW GAIN	1
21	625-509	ASSY CELL IR	1
22	625-511-112G	ASSY COVER PANEL FRONT	1
23	625-511-119	ASSY OVEN CELL MICRO	1
24	625-511-127	TUBE TC1 TO MANIFOLD DIVERTER	1
25	625-511-128	TUBE CAT OUT TO REAGENT IN	1
26	625-511-129	TUBE MAN DIVERTER TO MAN FLOW	1
27	625-511-134	ASSY PANEL TOP W/FAN MICRO	1
28	625-511-136	ASSY PANEL SIDE LEFT	1
29	625-511-141	NAMEPLATE ID TRUSPEC MICRO CHNS	1
30	625-511-155	ASSY BLOCK HEATER MICRO DEDICATED	1
31	625-511-156	ASSY MANIFOLD DIVERTER MICRO	1
32	633-101-253	MANIFOLD INLET IR INTL PL	2
33	633-101-282	GUARD INTERIOR MICRO	1
34	660-010-132	ASSY FAN W/BRACKET	1
35	660-011-109	O-RING 109 .299 x .505 x .103EP	1
36	660-013-056	ASSY FURNACE DUAL W/CAP MICRO	1
37	772-738	O-RING 010 .239X .379X.070V	6
38	775-306	FILTER SECONDARY 10MICRON	1

630-220-010-ILS-E

**Figure 10-31
Exploded View 5**

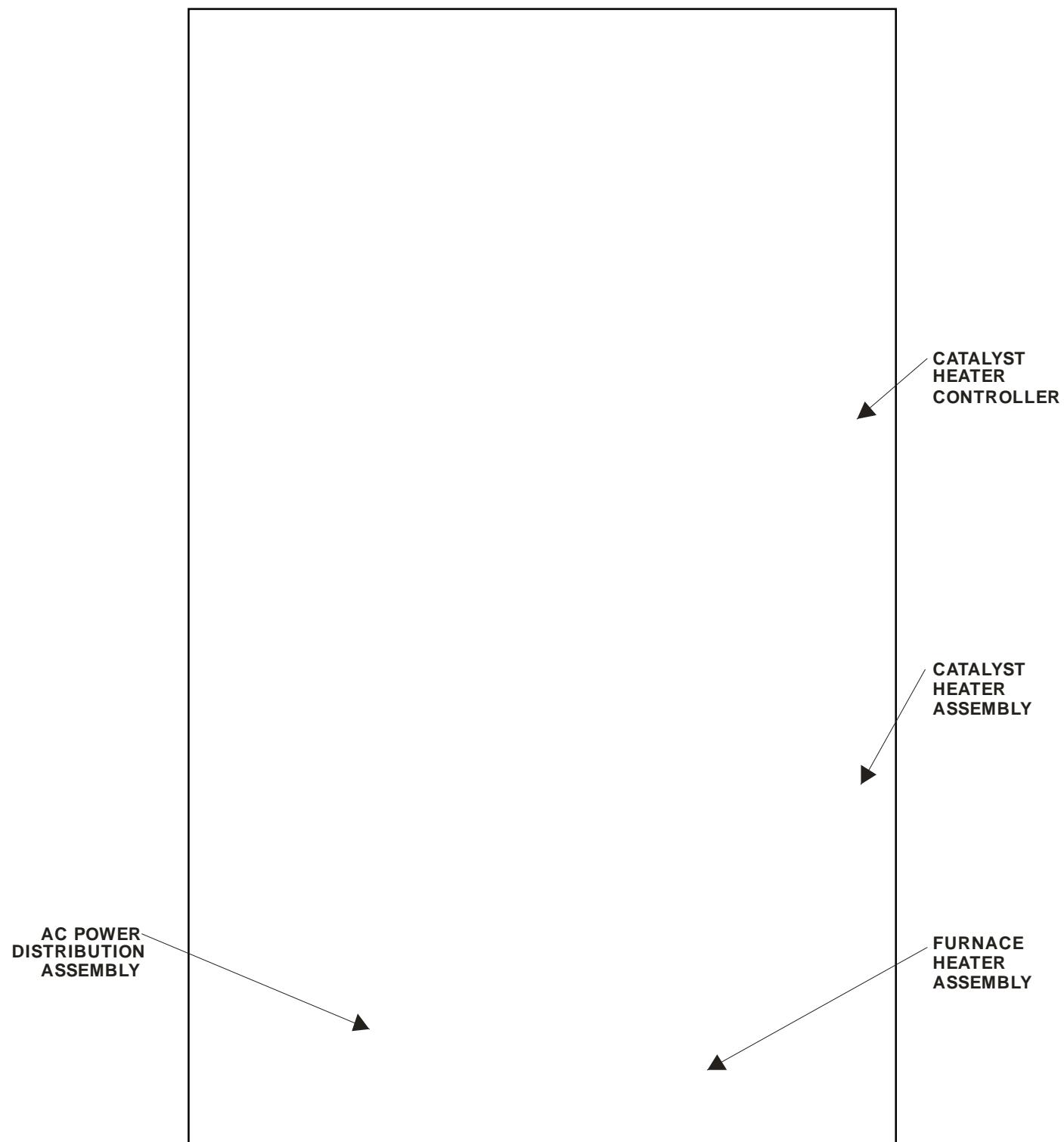


Figure 10-32
Left Side View

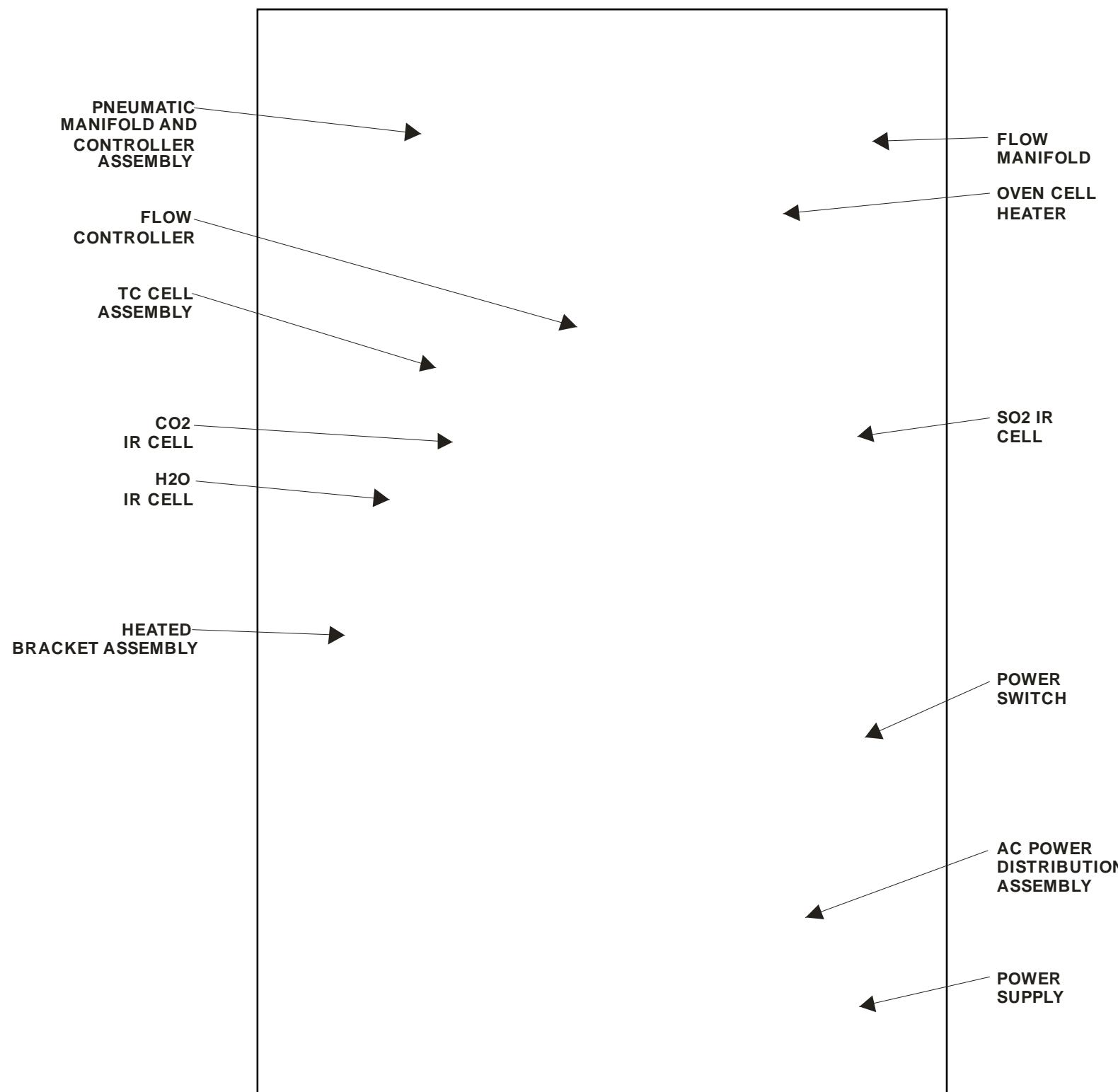


Figure 10-33
Right Side View

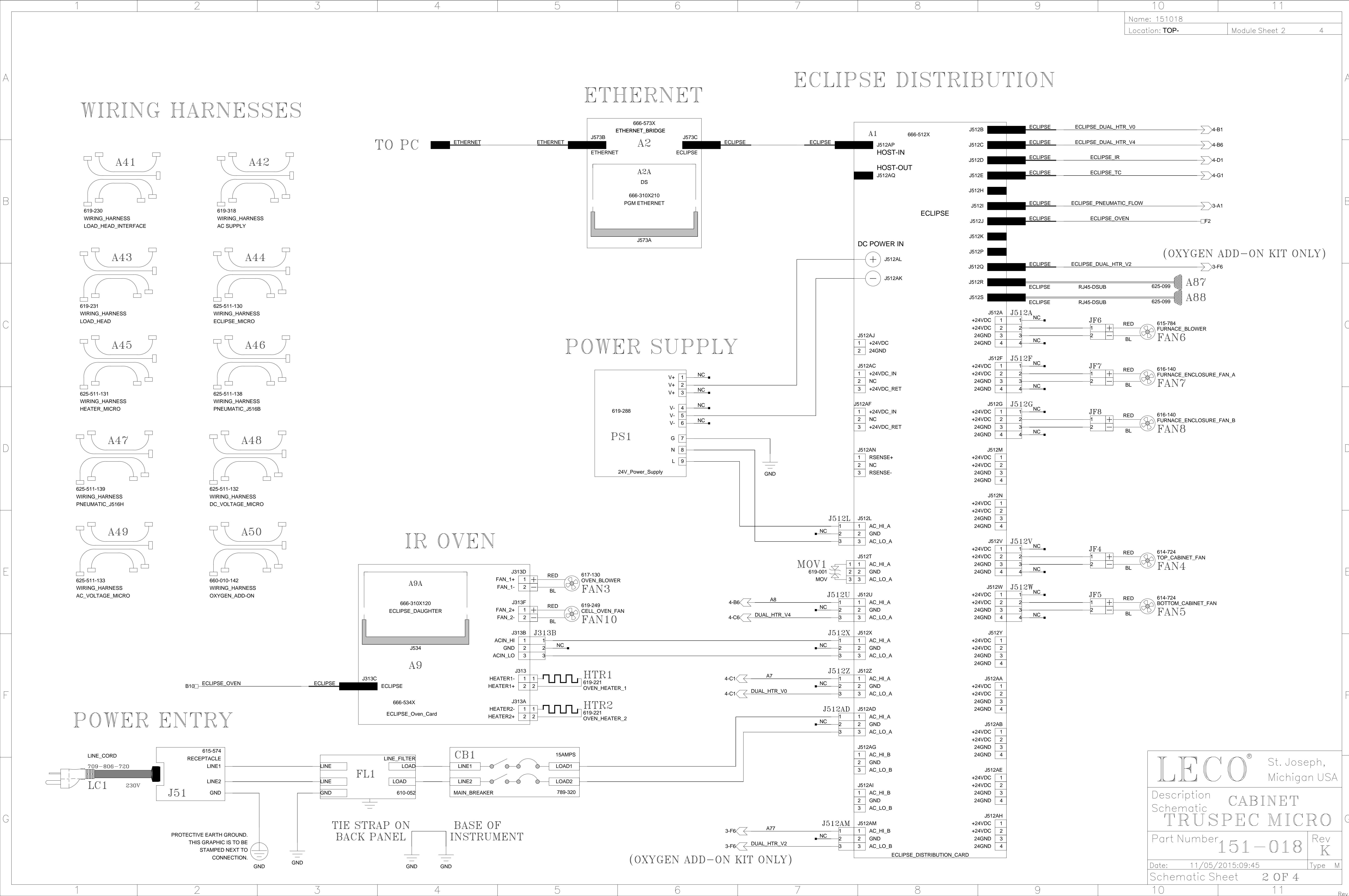
11 Schematics

The Schematics chapter provides electronic information for service of the instrument. For part numbers of circuit boards, assemblies and components, refer to the schematic diagrams.

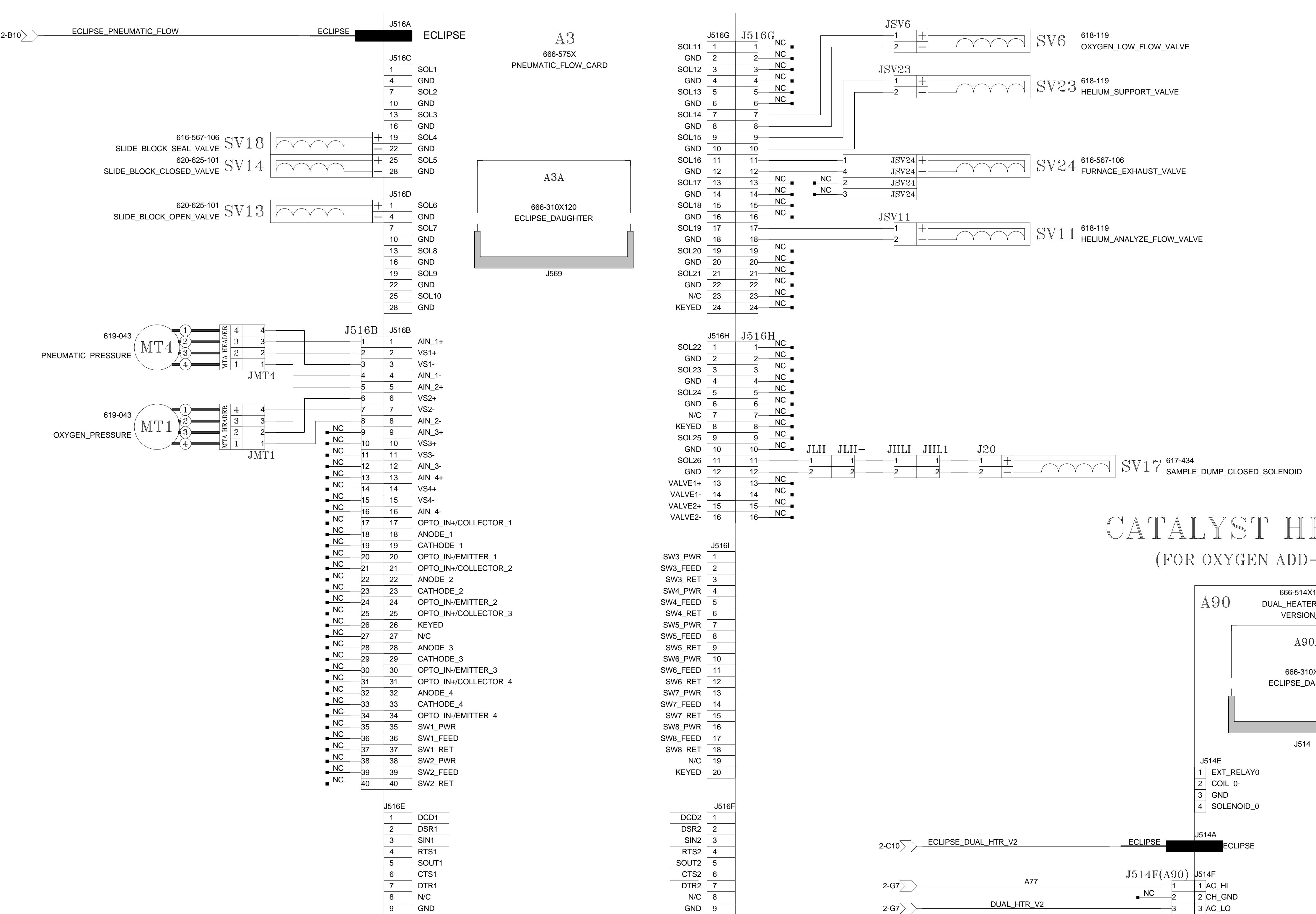
NOTE → This section only includes pages of the schematic drawing that are applicable for service of the instrument.

Figure 11-1 Distribution and Power Entry	11-3
Figure 11-2 Pneumatic Flow Card	11-4
Figure 11-3 Heater Control	11-5

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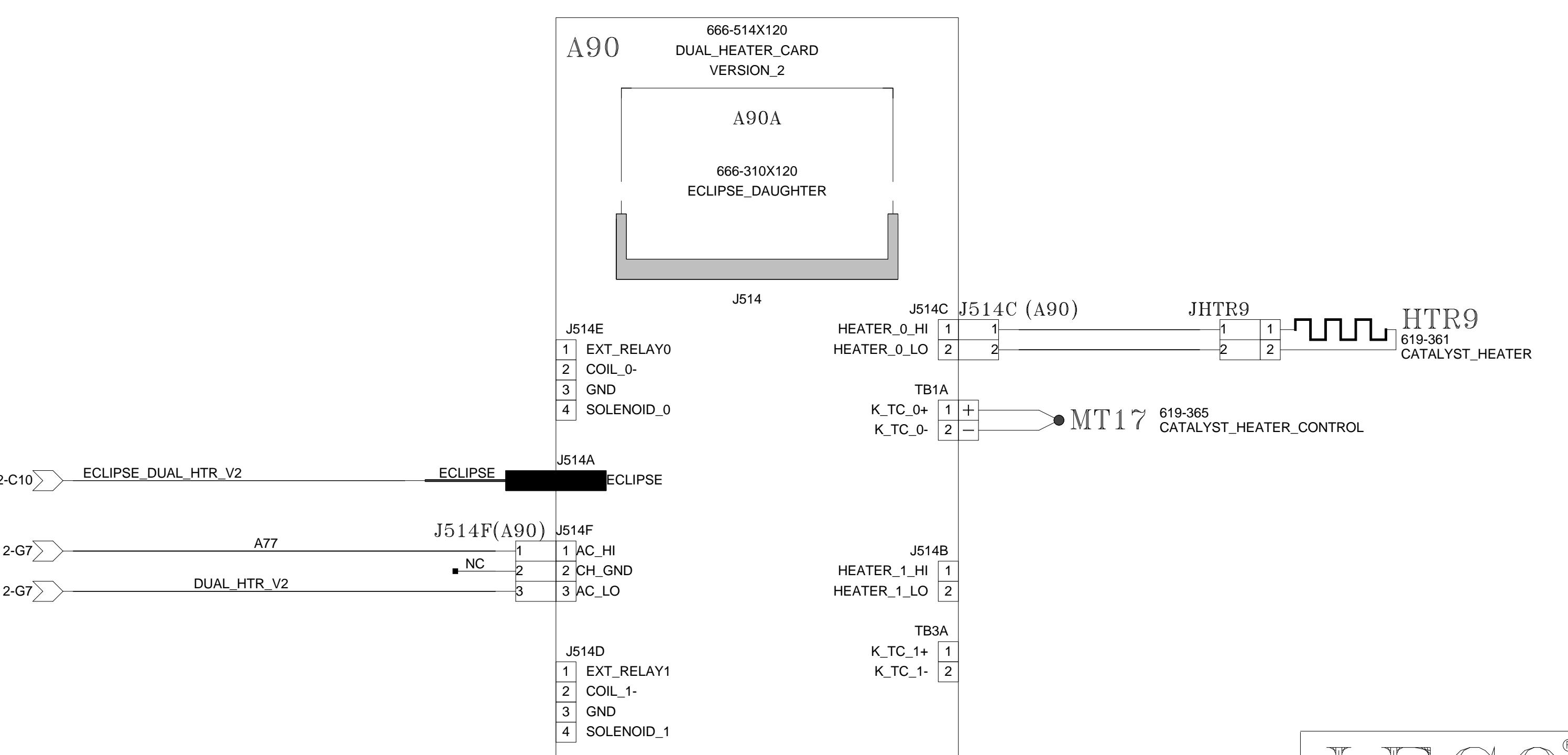


PNEUMATIC FLOW CARD



CATALYST HEATER CARD

(FOR OXYGEN ADD-ON KIT ONLY)



TIE STRAP ON
BACK PANEL SIDE
 PANEL

LECO® St. Joseph,
Michigan USA

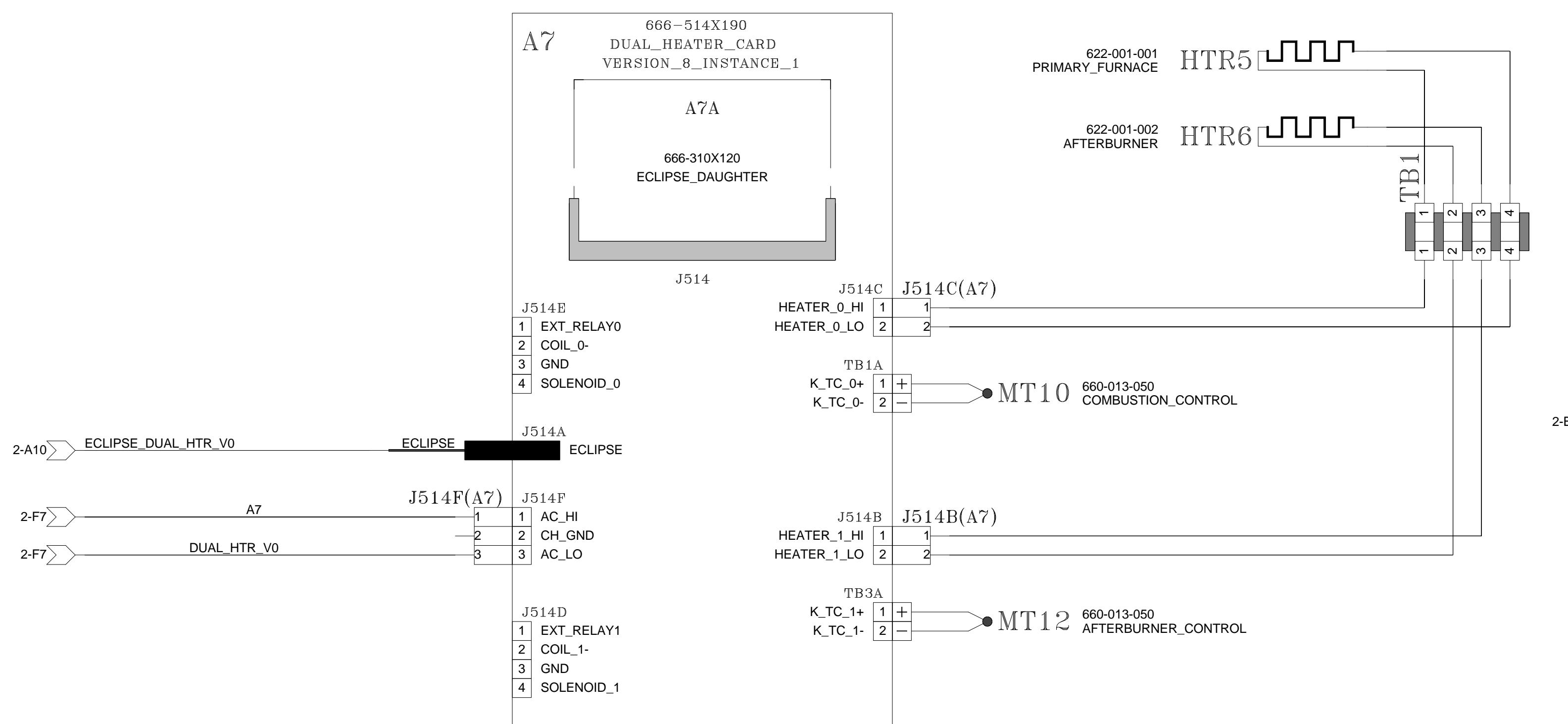
Description Schematic CABINET
Schematic TRUSPEC MICRO

Part Number 151-018 Rev
K

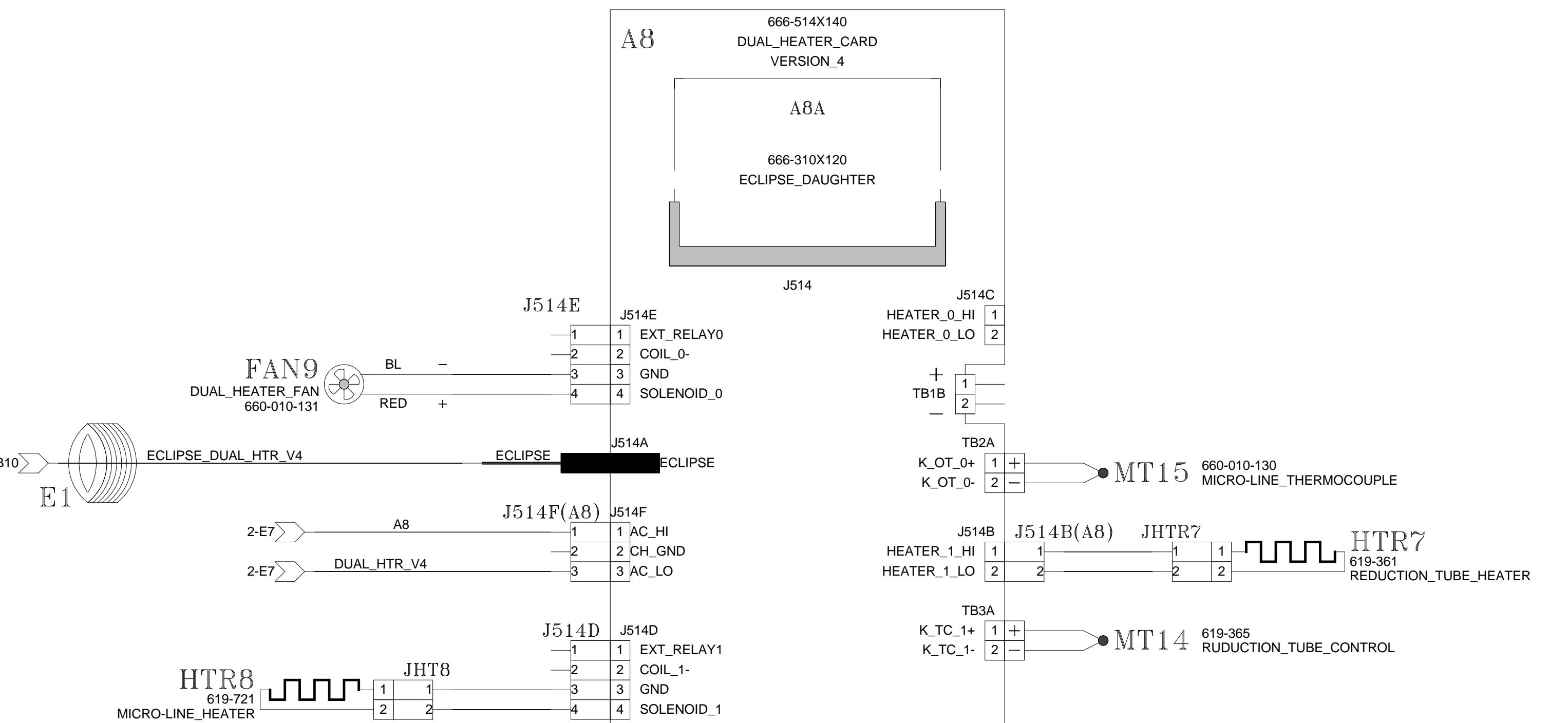
Date: 11/05/2015:09:45 Type M

Schematic Sheet 3 OF 4

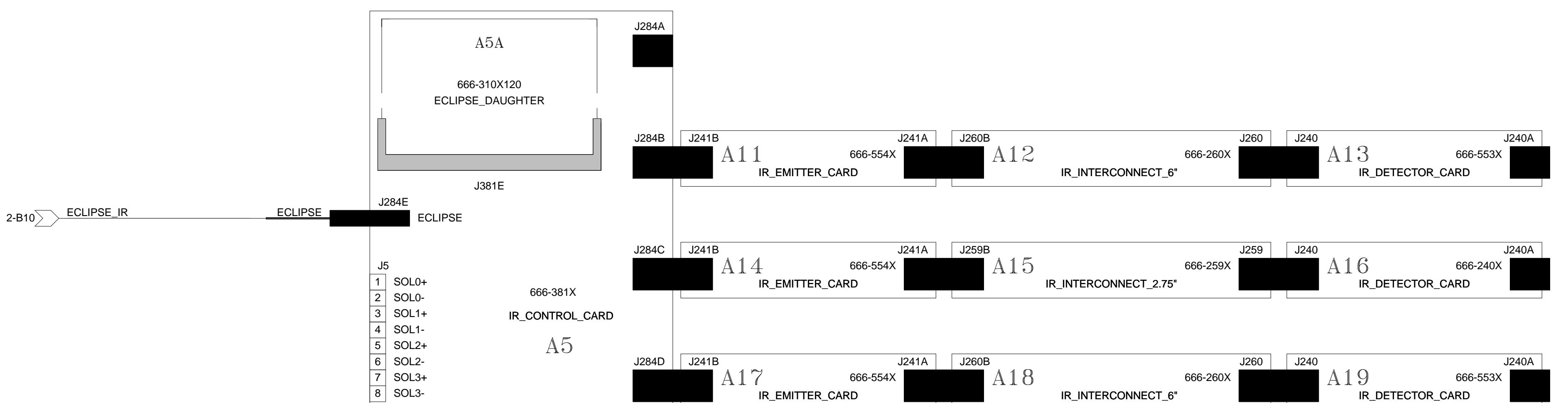
FURNACE CONTROL



HEATER CONTROL



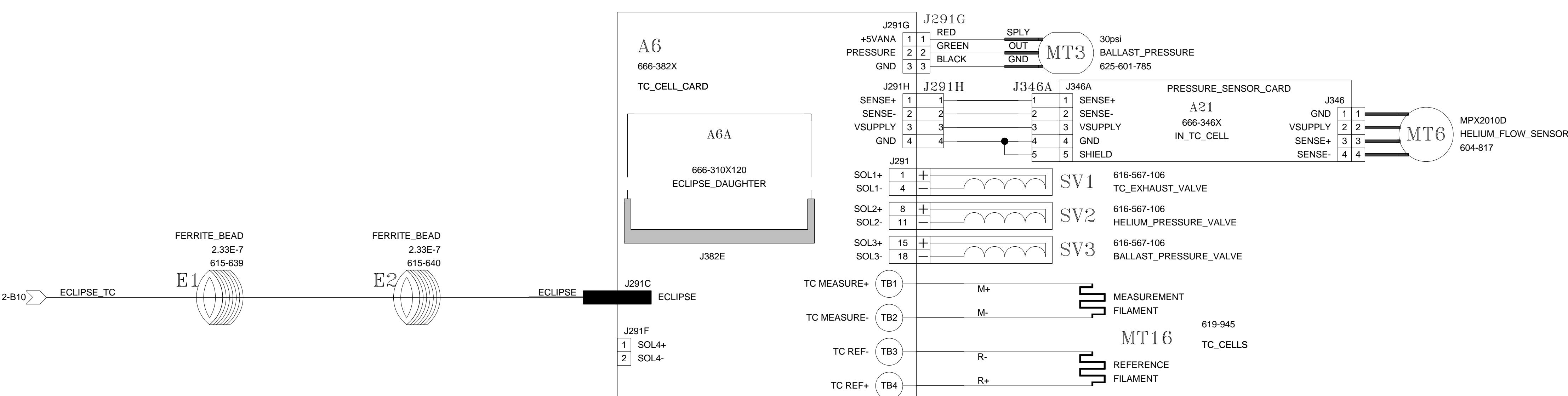
IR CELL



IR CELLS IN TRUSPEC DERIVATIVES

	CHN	CHNS
J284A	NOT USED	NOT USED
J284B	NOT USED	625-345-110 IR_CELL_6"_SO2
J284C	625-386 IR_CELL_2.75"_CO2	625-386 IR_CELL_2.75"_CO2
J284D	625-509 IR_CELL_6"_H20	625-509 IR_CELL_6"_H20

TC CELL



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