FP628
Nitrogen Determinator
Instruction Manual

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Patents are Pending in U.S.A. and other countries

Minor revisions may not be reflected in this manual.

Delivering the Right Results

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Original Instructions

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.

CAUTION

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

WARNING

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

CAUTION

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.

WARNING

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.

CAUTION

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

CAUTION

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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1 Introduction

The Introduction chapter contains general information about the FP628 Series Determinators, including safety guidelines and warranty terms. Reference this chapter for replacement parts, operating supplies, and optional accessories. To place an order by phone, call our customer service department toll-free in the United States at 1-800-292-6141 or 269-985-5496. Orders may also be sent by fax to 269-982-8977.

Illustrations

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WEEE

Disposal of WEEE and the Wheeled Bin Symbol

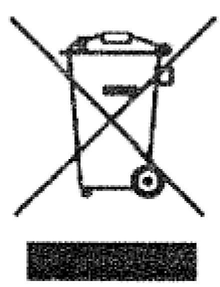
In 2002, the European Union introduced the Directive on Waste Electrical and Electronic Equipment (WEEE). The main aim of the Directive is to ensure that WEEE is collected and treated separately. WEEE may contain hazardous substances that should not end up in the (human) environment because it can have adverse effects on it.

Furthermore, WEEE is a vast source of raw materials. With the ever rising worldwide demand for new equipment and the ever decreasing volume of raw materials in nature, letting this potential source of such materials go to waste is unacceptable.

If equipment is collected separately, the equipment can be recycled and up to 85% to 90% of the equipment can be reused as new material, saving the use of virgin raw materials and energy of producing these. Separate collection and treatment of WEEE will thus decrease CO_2 emissions as well.

For the above reasons, LECO expects end users to dispose of the material in an environmentally friendly way, being separate collection and treatment.

Electrical and Electronic Equipment is labeled with the following “crossed-out wheeled bin” symbol, indicating that the equipment should be disposed of by the end user separate from other types of waste.



End users should contact their dealer/distributor or our company about disposal, collection, recycling options, and Safety Data Sheets (SDS information) in their country.

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.

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 nach seiner Lebensdauer nicht zusammen mit dem normalen Haushaltsmüll entsorgt 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 sollten sich an Ihren Lieferanten wenden und die Bedingungen des Verkaufsvertrags konsultieren. Dieses Produkt darf nicht zusammen mit anderem Gewerbemüll entsorgt werden.

Français

Comment éliminer ce produit

(déchets d'équipements électriques et électroniques)

(Applicable dans les pays de l'Union Européen et aux autres pays européens disposant de systémes 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.

Italiano

Corretto smaltimento del prodotto

(rifiuti elettrici ed elettronici)

(Applicabile in i paesi dell'Unione Europea e in quelli con sistema 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.

Español

Eliminación correcta de este producto

(material eléctrico y electrónico de descarte)

(Aplicable en la Unión Europea y en países europeos con sistenmas de recogida selectiva de residuos)

La presencia de esta marca en el producto o en el material informativo 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 recíclelo 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 informatiemateriaal 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.

Czech Republic

Správná likvidace tohoto produktu

(Zničení elektrického a elektronického zařízení)

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 znečištění životního prostředí nebo zranění člověka díky nekontrolovanému zničení, oddělte je prosíme od dalších typů odpadů 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 podrobností, kde a jak můžete tento výrobek bezpečně vzhledem k životnímu prostředí recyklovat.

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

Estonia

Õige viis toote kasutusest kõrvaldamiseks

(elektriliste ja elektrooniliste seadmete jäätmed)

Selline tähistus tootel või selle dokumentidel näitab, et toodet ei tohi kasutusaja lõppemisel kõrvaldada koos muude olmejäätmetega. Selleks, et vältida jäätmete kontrollimatu kõrvaldamisega seotud võimaliku kahju tekitamist keskkonnale või inimeste tervisele ning edendada materiaalsete vahendite säästvat taaskasutust, eraldage toode muudest jäätmetest ja suunake taasringlusse.

Kodukasutajad saavad teavet keskkonnaohutu ringlussevõtu kohta kas toote müüjalt või keskkonnaametist.

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

Finland

Tämän tuotteen turvallinen hävittäminen

(elektroniikka ja sähkölaitteet)

Oheinen merkintä tuotteessa tai tuotteen oheismateriaalissa merkitsee, että tätä tuotetta ei tule hävittää kotitalousjätteen mukana sen elinkaaren päätyttyä. Hallitsemattomasta jätteenkäsittelystä ympäristölle ja kanssaihmisten terveydelle aiheutuvien vahinkojen välttämiseksi tuote tulee käsitellä muista jätteistä erillään. Jäte on hyvä kierrättää raaka-aineiksi kestävän ympäristökehityksen takia.

Kotitalouskäyttäjien tulisi ottaa yhteyttä tuotteen myyneeseen jälleenmyyjään tai paikalliseen ympäristöviranomaiseen, jotka antavat lisätietoja tuotteen turvallisista kierrätysmahdollisuuksista.

Yrityskäyttäjien tulisi ottaa yhteyttä tavarantoimittajaan ja selvittää hankintasopimuksen ehdot. Tätä tuotetta ei tule hävittää muun kaupallisen jätteen seassa.

Slovenia

Ustrezno odstranjevanje tega izdelka

(odpadna električna in elektronska oprema)

Oznaka na izdelku ali spremljevalni 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 reciklirajte ter tako spodbudite trajnostno ponovno uporabo materialnih virov.

Uporabniki v gospodinjstvih naj za podrobnosti o tem, kam in kako lahko odnesejo ta izdelek na okolju varno recikliranje, pokličejo trgovino, kjer so izdelek kupili, ali lokalni vladni urad.

Podjetja naj pokličejo dobavitelja in preverijo pogoje nabavne pogodbe. Tega izdelka pri odstranjevanju ne smete mešati z drugimi gospodarskimi odpadki.

Sweden

Korrekt avfallshantering av produkten

(elektriska och elektroniska produkter)

Denna markering på produkten och i manualen 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 ändamålsenlig återvinning av dess beståndsdelar.

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

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

Latvia

Izstrādājuma pareiza likvidēšana

(nolietotas elektriskās un elektroniskās ierīces)

Uz izstrādājuma vai tam pievienotajās instrukcijās dotais marķējums 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 jānošķir no citiem atkritumiem un jāpārstrādā, lai sekmētu materiālo resursu atbildīgu atkārtotu lietošanu.

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

Rūpnieciskajiem lietotājiem jāsazinās ar piegādātāju un jāpārbauda pirkuma līguma nosacījumi. Šo izstrādājumu nedrīkst sajaukt ar citiem likvidējamiem rūpnieciskajiem atkritumiem.

Greece

Σωστή Διάθεση αυτού του Προϊόντος

(Απορρίμματα Ηλεκτρικού & Ηλεκτρονικού Εξοπλισμού)

Τα σήματα που εμφανίζονται επάνω στο προϊόν ή στα εγχειρίδια που το συνοδεύουν, υποδεικνύουν ότι δεν θα πρέπει να ρίπτεται μαζί με τα υπόλοιπα οικιακά απορρίμματα μετά το τέλος του κύκλου ζωής του. Προκειμένου να αποφευχθούν ενδεχόμενες βλαβερές συνέπειες στο περιβάλλον ή την υγεία εξαιτίας της ανεξέλεγκτης διάθεσης απορριμμάτων, σας παρακαλούμε να το διαχωρίσετε από άλλους τύπους απορριμμάτων και να το ανακυκλώσετε, ώστε να βοηθήσετε στην βιώσιμη επαναχρησιμοποίηση των υλικών πόρων.

Οι οικιακοί χρήστες θα πρέπει να έλθουν σε επικοινωνία είτε με τον πωλητή απ' όπου αγόρασαν αυτό το προϊόν, είτε τις κατά τόπους υπηρεσίες, προκειμένου να πληροφορηθούν τις λεπτομέρειες σχετικά με τον τόπο και τον τρόπο με τον οποίο μπορούν να δώσουν αυτό το προϊόν για ασφαλή προς το περιβάλλον ανακύκλωση.

Οι επιχειρήσεις-χρήστες θα πρέπει να έλθουν σε επαφή με τον προμηθευτή τους και να ελέγξουν τους όρους και τις προϋποθέσεις του συμβολαίου πώλησης. Το προϊόν αυτό δεν θα πρέπει να αναμιγνύεται με άλλα συνηθισμένα απορρίμματα προς διάθεση.

Poland

Prawidłowe usuwanie produktu

(zużyty sprzęt elektryczny i elektroniczny)

Oznaczenie umieszczone na produkcie lub w odnoszących się do niego tekstach wskazuje, że produktu po upływie okresu użytkowania nie należy usuwać z innymi odpadami pochodzącymi 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 materialnych jako stałej 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 sprzedaży 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.

Macedonia

Правилно отстранување на овој производ

(Истрошена електрична и електронска опрема)

Оваа ознака прикажана на производот или во неговата документација покажува дека тој не треба да се фрла со преостанатиот отпад од домаќинствата, кога веќе нема да биде употреблив. За да се избегне можното нарушување на животната средина или на човековото здравје, како резултат на неконтролираното отстранување на отпадот, ве молиме да го одделите од другите видови отпад и совесно да го рециклирате, за да промовирате одржлива повторна употреба на материјалните ресурси.

Корисниците во домаќинствата треба да се обратат до дистрибутерите кај кои го купиле производот или до локалните власти, за да ги дознаат деталите за тоа каде и како можат да го однесат производот заради рециклирање коешто е безбедно за животната средина.

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

Norway

Korrekt avhending 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 slutten av sin levetid. For å hindre mulig skade på miljøet eller menneskelig helse fra ukontrollert avfallsavhending, vennligst atskill dette fra andre typer avfall og resirkuler det ansvarlig for å fremme bærekraftig gjenbruk 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.

Romania & Moldova

Evacuarea corectă a acestui produs

(reziduuri provenind din aparatură electrică şi electronică)

Marcajele de pe acest produs sau menţionate în instrucţiunile sale de folosire indică faptul că produsul nu trebuie aruncat împreună cu alte rezuduuri din gospodărie atunci când nu mai este în stare de funcţionare. Pentru a preveni posibile efecte dăunătoare asupra mediului înconjurător sau a sănătăţii oamenilor datorate evacuării necontrolate a reziduurilor, vă rugăm să separaţi acest produs de alte tipuri de rezuduuri şi să-l reciclaţi în mod responsabil pentru a promova refolosirea resurselor materiale.

Utilizatorii casnici sunt rugaţi să ia legătura fie cu distribuitorul de la care au achiziţionat acest produs, fie cu autorităţile locale, pentru a primi informaţii cu privire la locul şi modul în care pot depozita acest produs în vederea reciclării sale ecologice.

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

Bulgaria

Изхвърляйте правилно този продукт

(отпадъчно електрическо и електронно оборудване)

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

При употреба за битови нужди трябва да се свържете с продавача на дребно, от когото сте закупили продукта или с местните власти за подробности относно това къде и как можете да предадете продукта за безопасно рециклиране.

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

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 almindeligt husholdningsaffald efter endt levetid. For at undgå skadelige miljø- eller sundhedspåvirkninger på grund af ukontrolleret affaldsbortskaffelse skal dette produkt bortskaffes særskilt fra andet affald og indleveres behørigt til fremme for bæredygtig 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 miljøforsvarlig genvinding.

Erhvervsbrugere bedes kontakte leverandøren og læse betingelserne og vilkårene i købekontrakten. Dette produkt bør ikke bortskaffes sammen med andet erhvervsaffald.

Republic of Ireland (Gaelic)

Diúscairt Cheart an Táirge Seo

(Trealamh Leictreach agus Leictreonach Dramhaíola)

Léiríonn an mharcáil seo atá ar an táirge nó sa litríocht a thagann leis, nár chóir é a dhiúscairt le dramhaíl tí eile ag deireadh a shaoil oibre. Chun cosaint i gcoinne dochar don chomhshaol nó do shláinte an duine, a d'fhéadfadh bheith mar thoradh ar an ndiúscairt dramhaíola neamhtheoranta, scar an dramhaíl seo ó chineálacha eile dramhaíola le do thoil agus déan athchúrsáil fhreagrach air chun athúsáid inmharthana na hacmhainní ábhartha a chur chun cinn.

Ba chóir dóibh siúd a úsáideann an trealamh sa bhaile dul i dteagmháil leis an díoltóir ónar cheannaigh siad an táirge seo, nó lena n-oifig áitiúil Rialtais, ar mhaithe le sonraí a fháil faoi cá háit agus cathain is féidir athchúrsáil atá slán ó thaobh an chomhshaoil de a dhéanamh ar an táirge seo.

Ba chóir dóibh siúd a úsáideann an trealamh seo ina ngnó dul i dteagmháil leis an soláthróir agus téarmaí agus coinníollacha an chonartha ceannaigh a sheiceáil. Níor chóir an táirge seo a chur le dramhaíl eile tráchtála agus diúscairt á déanamh.

Slovakia

Správna likvidácia tohoto 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 môžete predísť tým, že budete takéto typy výrobkov oddeľovať od ostatného odpadu a vrátite ich na recykláciu.

Používatelia v domácnostiach by pre podrobné informácie, ako ekologicky bezpečne naložiť s týmto výrobkom, mali kontaktovať buď predajcu, ktorý im výrobok predal, alebo príslušný úrad v okolí ich bydliska.

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

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 reciclá-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.

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 hulladékkal együtt kidobni. Annak érdekében, hogy megelőzhető legyen a szabálytalan hulladékleadás által okozott környezet- és egészségkárosodás, különítse ezt el a többi hulladéktól, és felelősségteljesen gondoskodjon a hulladék leadásáról, a hulladékanyagok fenntartható szintű újrafelhasználása céljából.

A háztartási felhasználók a termék forgalmazójától vagy a helyi önkormányzati szervektől kérjenek tanácsot arra vonatkozóan, hová és hogyan vihetik el ez elhasznált terméket a környezetvédelmi szempontból biztonságos hulladékleadás céljából.

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

Lithuania

Tinkamas produkto atliekų tvarkymas

(atitarnavusi elektros ir elektronikos įranga)

Šis ženklas, pateikiamas ant produkto ar jo dokumentacijoje, nurodo, kad pasibaigus produkto tarnavimo laikui, jo negalima išmesti kartu su kitomis buitinėmis atliekomis. Kad būtų išvengta galimos nekontroliuojamo atliekų išmetimo žalos aplinkai arba žmonių sveikatai, ir siekiant skatinti aplinką tausojantį antrinių žaliavų panaudojimą, pašom atskirti jį nuo kitų rūšių atliekų ir atiduoti perdirbti.

Informacijos, kur ir kaip pristatyti šį produktą saugiai perdirbti, privatūs vartotojai turėtų kreiptis arba į parduotuvę, kurioje šį produktą pirko, arba į vietines valdžios institucijas.

Verslo vartotojai turėtų kreiptis į savo tiekėją ir peržiūrėti pirkimo sutarties sąlygas. Šis produktas tvarkant atliekas negali būti sumaišytas su kitomis atliekomis.

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a) This Software License shall be binding upon and inure to the benefit of the parties hereto and their respective successors and assigns, provided that Licensee shall not have any right to assign its rights or obligations under this Software License (whether by operation of law or otherwise) without the prior written consent of LECO.

b) All notices hereunder shall be in writing and shall be sent by registered or certified mail postage prepaid to LECO at the addresses first written above. The date of postmark shall be deemed the date on which such notice is given.

c) No delay on the part of LECO in exercising any right, power or remedy hereunder shall operate as a waiver thereof, nor shall any single or partial exercise of any such right, power or remedy preclude any other or further exercise thereof or the exercise of any other right, power or remedy.

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f) Licensee agrees that it is responsible for obtaining proper authorization and complying with any export, re-export, or import laws or regulations and that may apply if Licensee exports, re-exports, or imports the Licensed Software, technology or technical data licensed hereunder.

Warranty

Equipment manufactured by LECO Corporation, St. Joseph, Michigan is warranted free from defect in material and workmanship for a period of 1) thirteen months from date of shipment or 2) twelve months from date of installation, whichever occurs first. Equipment not manufactured by LECO is covered to the extent of warranty provided by the original manufacturer and this warranty does not cover any equipment, new or used, purchased from anyone other than LECO Corporation. All replacement parts shall be covered under warranty for a period of thirty days from date of purchase. **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**.

Expendable items such as crucibles, combustion tubes, chemicals, and items of like nature are not covered by this warranty.

LECO's sole obligation under this warranty shall be to repair or replace any part or parts which, to our satisfaction, prove to be defective upon return prepaid to LECO Corporation, St. Joseph, Michigan. This obligation does not include labor to install replacement parts, nor does it cover any failure due to accident, abuse, neglect, or use in disregard of instructions furnished by LECO. In no event shall damages for defective goods exceed the purchase price of the goods, and **LECO shall not be liable for incidental or consequential damages whatsoever.**

All claims in regard to the parts or equipment must be made within ten (10) days after Purchaser learns of the facts upon which the claim is based. Authorization must be obtained from LECO prior to returning any other parts. This warranty is voided by failure to comply with these notice requirements.

Notice

The warranty on LECO equipment remains valid only when genuine LECO replacement parts are employed. Since LECO has no control over the quality or purity of consumable products not manufactured by LECO, the specifications for accuracy of results using LECO instruments are not guaranteed unless genuine LECO consumables are employed in conjunction with LECO instruments. If purchaser defaults in making payment for any parts or equipment, this warranty shall be void and shall not apply to such parts and equipment. No late payment or cure of default in payment shall extend the warranty period provided herein.

LECO Corporation is not responsible for damage to any associated instruments, equipment, or apparatus nor will LECO be held liable for loss of profit or other special damages resulting from abuse, neglect, or use in disregard of instructions. The Buyer, their employees, agents, and successors in interest assume all risks and liabilities for the operation, use, and/or misuse of the product(s) described herein and agree to indemnify, hold harmless, and defend the seller from any and all claims and actions arising from any cause whatsoever, including seller's negligence for personal injury incurred in connection with the use of said product(s) and any and all damages proximately resulting therefrom.

LECO-Supplied Computers

Hewlett-Packard® Support

All LECO-supplied *Hewlett-Packard* computers include HP® customer technical support and warranty claim information.

The inclusion of HP® customer technical support and product warranty with LECO-supplied *HP* Computers ensures that any computer-related service issues are handled directly by the experts at *HP*. This eliminates the unnecessary step of working through the LECO service professionals for a resolution from *HP*.

For more information, call 1-800-HPinvent (1-800-474-6836), or access the *HP* website by following the link below and selecting the appropriate country and support language:

http://www8.hp.com/us/en/contact-hp/ww-contact-us.html

Please have your *HP* computer serial number and model number available when contacting *HP* to expedite service. These can be found on the back or side of the computer tower.

Declaration of Conformity Statement

European Union Directives - CE Marking

This equipment, which bears the CE Marking, complies with all the applicable requirements set out in the EU Directives.

NOTE The EU Declaration of Compliance (EU-DoC) for this instrument is available upon request.

The following information sets out the content of the EU-DoC, including a list of EU Directives, harmonized standards, supporting standards and other applicable documents.

Machinery Directive 2006/42/EC (Product Safety)

EN ISO 12100 Risk Assessment - Safety of Machinery

EN/IEC 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use.

EMC Directive 2004/108/EC (Electromagnetic Compatibility)

EN55011 RF Emissions Class A

EN 61000-3-2 & EN 61000-3-12 Harmonic Emissions

EN 61000-3-3 & EN 61000-3-11 Flicker Emissions

EN 61326-1 EMC requirements for electrical equipment for measurement, control, and laboratory use.

CISPR11 RF Emissions Class A

IEC 61000-4-2 Electrostatic Discharge

IEC 61000-4-3 Radiated RF Immunity

IEC 61000-4-4 Fast Transient Burst

IEC 61000-4-5 Surge Immunity

IEC 61000-4-6 Conducted RF Immunity

IEC 61000-4-8 Magnetic Immunity

IEC 61000-4-11 Voltage Dips, Interrupts

Product Safety

The equipment is also designed and manufactured to meet the following product safety requirements.

International

IEC 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use.

USA

UL 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use.

Canada

CAN/CSA-C22.2 No. 61010 Safety requirements for electrical equipment for measurement, control, and laboratory use.

Australia & New Zealand

AS/NZS 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use.

Electromagnetic Compatibility Notices

USA

Federal Communications Commission (FCC) statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 18 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. LECO Corporation is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 18 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that might cause undesired operation.

Canada

Industry Canada Class A Emission Compliance Statement

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

This Class A digital apparatus complies with Canadian ICES-003.

European Union

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. LECO Corporation cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-authorized modification of the product.

Attention: This is an EN 55011 Class A Group 1 product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

Australia & New Zealand

Attention: This is a CISPR 11 Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

Radio-Frequency Disturbance

This product complies with IEC/EN 55011/CISPR11 Radio-frequency disturbance characteristics of industrial, scientific and medical equipment (ISM), which requires the following information to be provided within the User Documentation:

NOTE → The use of **Interconnecting Cables** other than those provided and/or specified may cause undesired electromagnetic compatibility performance.

Definitions

NOTE → This is a Class A Group 1 Product.

Class A equipment is equipment suitable for use in all establishments other than domestic and those directly connected to a low-voltage power supply network that supplies buildings used for domestic purposes.

Class B equipment is equipment suitable for use in domestic establishments and in establishments directly connected to a low-voltage power supply network that supplies buildings used for domestic purposes.

Group 1 equipment contains all equipment in the scope of this standard that is not classified as group 2 equipment.

Group 2 equipment contains all ISM RF equipment (Industrial, Scientific, Medical) in which radio-frequency energy in the frequency range 9 kHz to 400 GHz is intentionally generated and used, or only used, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/analysis purposes.

Flicker and Harmonic Emissions

To reduce the chance of voltage fluctuations, flicker emissions, or harmonic emissions, it is recommended that this equipment be connected to a private low-voltage distribution system. If connected to a public low-voltage distribution system a minimum facility service current capacity of 100 amps is required. Consultation with the distribution system authority may be required.

Equipment Packages

Items listed as follows are repeated throughout this manual and are subject to revision. Please consult the packing slip received with the instrument.

FP628C Package consisting of FP628 with PC

1	259-077	SOFTWARE KIT 628 SERIES
1	501-171-HAZ*	ANHYDRONE 10-16 MESH 1/LB
1	501-609-HAZ*	REAGENT FURNACE 100G
1	502-174-HAZ*	LECOSORB 20-30 MESH 500G
1	618-380	CASE HOLDER CD-12 BLUE/BLACK
1	622-000-200	ASSY FP628 230V
1	704-241	ASSY KEY COPY PROTECTION
1	622-001-396	PACK ACCESSORY FP628
1	686-550	MONITOR PC 19 IN NEC
1	686-637	ASSY PC TOWER 628 SERIES HP

*Packed and shipped separately in the U.S.A. Not included with international shipments due to shipping regulations. These items are essential for operation. Contact your LECO distributor for quotation and delivery.

FP628CR Package consisting of FP628 No PC

1	259-077	SOFTWARE KIT 628 SERIES
1	501-171-HAZ*	ANHYDRONE 10-16 MESH 1/LB
1	501-609-HAZ*	REAGENT FURNACE 100G
1	502-174-HAZ*	LECOSORB 20-30 MESH 500G
1	618-380	CASE HOLDER CD-12 BLUE/BLACK
1	622-000-200	ASSY FP628 230V
1	622-001-350	DISK CAL HARDWARE 628 SERIES
1	704-241	ASSY KEY COPY PROTECTION
1	622-001-396	PACK ACCESSORY FP628

*Packed and shipped separately in the U.S.A. Not included with international shipments due to shipping regulations. These items are essential for operation. Contact your LECO distributor for quotation and delivery.

FP628ARC Package consisting of FP628 Argon with PC

1	259-077	SOFTWARE KIT 628 SERIES
1	501-171-HAZ*	ANHYDRONE 10-16 MESH 1/LB
1	501-609-HAZ*	REAGENT FURNACE 100G
1	502-174-HAZ*	LECOSORB 20-30 MESH 500G
1	618-380	CASE HOLDER CD-12 BLUE/BLACK
1	622-001-396	PACK ACCESSORY FP628
1	622-100-300	ASSY FP628 ARGON 230V
1	704-241	ASSY KEY COPY PROTECTION
1	686-550	MONITOR PC 19 IN NEC
1	686-637	ASSY PC TOWER 628 SERIES HP

*Packed and shipped separately in the U.S.A. Not included with international shipments due to shipping regulations. These items are essential for operation. Contact your LECO distributor for quotation and delivery.

FP628ARCR Package consisting of FP628 Argon, No PC

1	259-077	SOFTWARE KIT 628 SERIES
1	501-171-HAZ*	ANHYDRONE 10-16 MESH 1/LB
1	501-609-HAZ*	REAGENT FURNACE 100G
1	502-174-HAZ*	LECOSORB 20-30 MESH 500G
1	618-380	CASE HOLDER CD-12 BLUE/BLACK
1	622-001-350	DISK CAL HARDWARE 628 SERIES
1	622-001-396	PACK ACCESSORY FP628
1	622-100-300	ASSY FP628 ARGON 230V
1	704-241	ASSY KEY COPY PROTECTION

*Packed and shipped separately in the U.S.A. Not included with international shipments due to shipping regulations. These items are essential for operation. Contact your LECO distributor for quotation and delivery.

Options

(622-000-2OP)

1	051-080	SPEC SHEET AUTOLOADER RC/SC/TS
1	501-050	STD NICOTINIC ACID 15G
1	501-053	SAMPLE ACETANILIDE CARBON 71% 10G
1	501-081	WOOL GLASS 1LB
1	501-171-HAZ*	ANHYDRONE 10-16 MESH 1/LB
1	501-441	SAMPLE CALIBRATION CHN 50/GR
1	501-563-150	SAMPLE FLOUR CORN 7% PROTEIN 50G
1	501-571	CAPSULE COPPER 100BT
1	501-609-HAZ*	REAGENT FURNACE 100G
1	502-008	PLUG TIN 100/BT
1	502-040	CAPSULE TIN .250X.625 100BT
1	502-040-100	CAPSULE TIN .250X.625 1000BT
1	502-049	REAGENT N CATALYST 50G
1	502-055	SAMPLE S IN ORCH LEAVES 20G
1	502-082	SAMPLE SULFUR IN TOBACCO 20G
1	502-092	SAMPLE CAL EDTA 50G
1	502-167	CAPSULE TIN .343X .750 100/BT
1	502-174-HAZ*	LECOSORB 20-30 MESH 500G
1	502-177	WOOL QUARTZ FINE 50G
1	502-186-100	CUP SAMPLE TIN FOIL 1000BT
1	502-186-200	CUP SAMPLE TIN FOIL 100BT
1	502-188	ALUMINA OXIDE PELLET 200G
1	502-189	COPPER STICKS DEOXIDIZED 100G AMPOULE
1	502-211	SAMPLE GLYCINE 99PCT GL 50G
1	502-272	STD PROTEIN IN CORNMEAL GLT 50G
1	502-273	STD PROTEIN IN ALFALFA 50G
1	502-274	STD PROTEIN IN WHOLE WHEAT 50G
1	502-275	STD PROTEIN IN MED RYE FL 50G
1	502-276	STD PROTEIN IN OAT MEAL 50G
1	502-277	STD PROTEIN BARLEY FLOUR 50G
1	502-278	STD PROTEIN WHITE RICE 50G
1	502-397	CUP SAMPLE TIN LARGE 100/PK
1	502-397-400	CUP SAMPLE TIN LARGE 400/PK
1	502-445-HAZ*	PACK TRUESSENTIAL SM TIN CUP
1	502-446-HAZ*	PACK TRUESSENTIAL LG TIN CUP
1	502-478	SYRINGE 1.0ML 2IN NEEDLE PT 3
1	502-601	STD AMMONIUM AS N 100 UG/ML 5X10ML VIALS
1	502-602	STD AMMONIUM AS N 1000 UG/ML 5X10ML VIALS

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1	502-640-HAZ*	PACK TRUESSENTIAL TIN CAP 1K
1	502-642	STD RM PHENYLALANINE 99% 50G
1	502-680	STD RM COAL PROX PLUS LOW 50G
1	502-681	STD RM COAL PROX PLUS MED 50G
1	502-682	STD RM COAL PROX PLUS HIGH 50G
1	502-683	STD RM MET COKE PROX PLUS 50G
1	502-684	STD RM PET COKE PROX PLUS 50G
1	608-379	STRIP QUARTZ WOOL 15 IN 10/PK
1	614-961-110	CRUCIBLE POROUS FP-528 10/PK
1	617-605	CRUCIBLE AL POROUS LIQ SAMP10P
1	619-065	TUBE U FURNACE DUAL
1	619-180-110	KIT CAROUSEL STACKBL 30P
1	619-316	TUBE GLASS FILTER 2X
1	619-351-110	KIT CAROUSEL SHORT 30 POS
1	619-380	ASSY VACUUM HOT HEAD
1	619-434	ASSY VACUUM HOT HEAD 220V
1	619-523	ASSY MIRROR AUTOLOADER
1	619-630-110	KIT ASSY LOAD HEAD LIQUID
1	619-630-120	KIT DUCKBILL & O-RING 50/PK
1	619-680-101	TRAY VIAL SAMPLE 10/20 ML
1	619-995	READER BAR CODE CCD USB
1	620-632	CARTRIDGE COLOR PRNTR SERIES C
1	621-376	PURIFIER POWER 7.5KVA/5.25 KW DOMESTIC
1	622-001-277	ASSY MIRROR
1	625-390-101	BOTTLE WASH 100ML CAPS SEPTA
1	625-390-102	CORD TENSION LONG FOR INJ HEAD
1	625-390-103	CORD TENSION SHORT FOR INJ HEAD
1	625-401-350	AUTOTRANSFORMER 208-230V W/CB DOM
1	763-265	WOOL GLASS .50/LB
1	622-001-359	KIT SPARE PARTS FP628
1	502-338	CAPSULE QUIKCAP SMALL 400/PK
1	502-382	CAPSULE QUIKCAP MEDIUM 400/PK
1	502-810	CAPSULE QUIKCAP LARGE 400/PK
1	502-310	WOOL STEEL #2 1LB
1	502-751-HAZ*	PACK CONSUMABLE 628 SML TIN FOIL CUP 1K
1	502-752-HAZ*	PACK CONSUMABLE 628 LRG TIN FOIL CUP 1K
1	502-753-HAZ*	PACK CONSUMABLE 628 SML GEL CAP 1K
1	502-754-HAZ*	PACK CONSUMABLE 628 MED GEL CAP 1K
1	502-755-HAZ*	PACK CONSUMABLE 628 SML TIN CAP 1K
1	502-756-HAZ*	PACK CONSUMABLE 628 SML TIN FOIL CUP 5K
1	502-757-HAZ*	PACK CONSUMABLE 628 LRG TIN FOIL CUP 5K

(622-000-2OP)

1	502-758-HAZ*	PACK CONSUMABLE 628 SML GEL CAP 5K
1	502-759-HAZ*	PACK CONSUMABLE 628 MED GEL CAP 5K
1	502-760-HAZ*	PACK CONSUMABLE 628 SML TIN CAP 5K
1	051-094	SPEC SHEET 628 SERIES
1	619-591-933	O-RING 903 .301X .429X .064V
1	104-124-HAZ*	KIT PMA CHN/CN/FP628
1	104-125-HAZ*	KIT PMA CHN/CN/FP628 WITH SULFUR
1	625-602-470	C-FLEX ASSY
1	622-001-486	KIT CONVERSION FP628 TO CHN628 SN3333 & DOWN
1	622-001-484	KIT CONVERSION FP628 TO CN628 SN3333 & DOWN
1	502-825	CAPSULE TIN LARGE 9.05 X 21MM 50/BX
1	622-001-559	KIT LIQUID AUTOSAMPLER 628 SERIES
1	619-592-407	KIT REGULATOR PRESSURE 2-STAGE AIR CGA 346
1	619-592-403	KIT REGULATOR OXYGEN CGA 540
1	259-077-CPK	SOFTWARE KIT 628 SERIES W/KEY
1	259-077UPGR	SOFTWARE KIT 628 SERIES UPGRADE
1	619-680-102	SYRINGE 1ML 4IN 19GA/PT
1	619-680-103	NEEDLE 19/PTS3 511MM/2IN 3PK
1	619-680-104	GUIDE NEEDLE UPPER 19GA
1	619-680-105	ROD GUIDE NEEDLE
1	619-680-106	MAGNET SPACE HEAD
1	619-680-107	GUIDE NEEDLE LOWER 19GA
1	633-103-121	KIT CONVERSION ARGON FP628/CN628/CHN628
1	660-041	KIT INSTALLATION QUALIFICATION 628 SERIES
1	660-044	KIT OPERATION QUALIFICATION FP628
1	502-656	COPPER TURNINGS DEGASSED 60G
1	622-001-711	KIT CONVERSION FP628 TO CN628 SN3334 AND UP
1	622-001-713	KIT CONVERSION FP628 TO CHN628 SN3334 AND UP
1	619-591-636	LIGHT WORK LED TRIPOD FLEX/MAG MNT GRY
1	622-001-720	KIT TUBE EXIT FURNACE .25
1	622-001-722	KIT BALLAST 0.9L
1	751-350-110	KIT BALANCE 4-PLC SECURA124-1S
1	660-047	KIT INSTALLATION QUALIFICATION 628 SERIES W/LAS
1	660-048	KIT OPERATION QUALIFICATION FP628 SERIES W/LAS
1	502-844	STICK COPPER DEOXIDIZED 100G
1	104-163	KIT MAINT PARTS CHN/CN/FP628 W/EXT S MOD
1	622-001-559-	KIT LIQUID AUTOSAMPLER 628 SERIES HP
1	777-942	CARD ASSY SERIAL 4-PORT PCIE FOR HP PC
1	622-001-763	KIT TUBE EXIT FURNACE .25
1	502-637-HAZ*	PACK CONSUMABLE MED GEL CAP 5K 628
1	502-639-HAZ*	PACK CONSUMABLE SML GEL CUP 5K 628

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1	502-636-HAZ*	PACK CONSUMABLE SML TIN CUP 5K 628
1	502-638-HAZ*	PACK CONSUMABLE LRG TIN CAP 5K 628
1	104-168	KIT MAINT PARTS CHN/CN/FP628
1	660-013-051	KIT REPL TYPE-K THRMCPLE CN/CHN/FP628
1	633-103-250	KIT UPGRADE SEAL CELL TC HEATED
1	502-101-HAZ*	SAMPLE DURENE 10G
1	619-592-406	KIT REGULATOR INERT GAS CGA 580

*Packed and shipped separately in the U.S.A. Not included with international shipments due to shipping regulations. These items are essential for operation. Contact your LECO distributor for quotation and delivery.

Components and Accessories List

Accessory Pack FP628 (622-001-396)

1	501-241	LUB GREASE VACUUM 5.3OZ
1	501-614	SPATULA SAMPLE
1	502-007	CLEANER TUBE 8MM X 4FT
1	502-023	FUNNEL QUICK DISC TUBE
1	502-049	REAGENT N CATALYST 50G
1	502-092	SAMPLE CAL EDTA 50G
1	502-186-200	CUP SAMPLE TIN FOIL 100BT
1	502-189	COPPER STICKS DEOXIDIZED 100G AMPOULE
1	502-310	WOOL STEEL #2 1LB
1	502-382	CAPSULE QUIKCAP MEDIUM 400/PK
1	601-591	BEAKER 200ML
1	601-691-036	ASSY TUBE CFLEX .125ID X 36
1	604-378	TWEEZER CURVED SST 3.9
1	604-398	SLEEVE CAPSULE
4	608-379	STRIP QUARTZ WOOL 15 IN 10/PK
1	614-961-110	CRUCIBLE POROUS FP-528 10/PK
1	616-152	ASSY TOOL CRUCIBLE EXTRACTOR
1	616-513	TOOL O-RING
1	617-441	FILTER SCREEN 100MESH 1.25 SST
1	619-674	TUBE VENT H2O BAKEOUT PLT
1	763-265	WOOL GLASS .50/LB
1	778-321	ASSY TOOL LANCE EXTRACTOR
1	778-405	ASSY BLOCK CAPSULE STORAGE
1	789-260	ASSY TOOL WOOL EXTRACTOR
1	625-602-470	C-FLEX ASSY*
1	619-289	TUBE PURGE REAGENT PLT
2	601-442	O-RING 113 .562X .748X.093V
2	601-504	O-RING 147 2.687X 2.873X.093V
2	616-138	O-RING 221 1.437X 1.687X.125S
2	778-116	O-RING 256 5.750X 6.000X.125B
1	619-316	TUBE GLASS FILTER 2X
2	622-001-258	ASSY FILTER 0.60 MICRON
1	762-515	TOOL O-RING REMOVAL
1	502-656	COPPER TURNINGS DEGASSED 60G
1	633-103-233	COMPOUND ANTI SEIZE 4OZ TUBE
1	775-307	SCREW THUMB 10-24X1.00 SST
1	203-828	LIT ORGANIC SUPPLIES CAT
1	209-050-142	CD ROM CHN628 MAINTENANCE SVC VIDEO

Component Pack (622-020-070)

2	190-279	SCREW MPHP 8-32X .38 ST ZP
2	193-055	WASHER FLT .170X .437X.04STZP
2	604-312	CLIP FLASK
1	609-110	ASSY FLASK EXHAUST
1	619-180	ASSY CAROUSEL STACKABLE 30 POS
1	619-304	ASSY COVER DUST CAROUSEL
1	619-377	ASSY PLATE BYPASS
1	620-677	CABLE ASSY CAT 5 15' RJ45 SHLD
1	709-806-720	CORD POWER ASSY 8FT 15A/250V
1	762-458	ASSY CONNR NUT 9/16-18/.25CU T
1	775-303	ASSY CONNECTOR W/RELIEF HELIUM
1	780-485	ASSY CONNECTOR N2
1	780-844	ASSY HOSE VESSEL PRESSURE
1	709-806-808	RECEPTACLE SNGL 15A 250V BLK
1	709-806-809	COVER RECEPTACLE SNGL SST
1	619-154	TUBE CATALYST HEATER
1	619-268	TUBE REAGENT STRAIGHT
1	633-103-225	ASSY TUBE BOROS FILTER 1.0 X 11.39 W/SLEEVE
1	200-748	MANUAL INSTR FP628

Component Pack (622-020-071)

2	190-279	SCREW MPHP 8-32X .38 ST ZP
2	193-055	WASHER FLT .170X .437X.04STZP
2	604-312	CLIP FLASK
1	609-110	ASSY FLASK EXHAUST
1	619-154	TUBE CATALYST HEATER
1	619-180	ASSY CAROUSEL STACKABLE 30 POS
1	619-268	TUBE REAGENT STRAIGHT
1	619-304	ASSY COVER DUST CAROUSEL
1	619-377	ASSY PLATE BYPASS
1	619-592-394	ASSY CONNECTION FLX .25 PNEUMATIC 12FT
1	619-592-395	ASSY CONNECTION CU .125 GAS CARRIER 6FT
1	620-677	CABLE ASSY CAT 5 15' RJ45 SHLD
1	625-602-215	ASSY TUBE CONN O2 OUTLET GAS
1	709-806-720	CORD POWER ASSY 8FT 15A/250V
1	709-806-808	RECEPTACLE SNGL 15A 250V BLK
1	709-806-809	COVER RECEPTACLE SNGL SST
1	780-844	ASSY HOSE VESSEL PRESSURE
1	622-001-756	ASSY FURNACE BYPASS LEAK CHECK CN/FP
1	633-103-225	ASSY TUBE BOROS FILTER 1.0 X 11.39 W/SLEEVE
1	200-748	MANUAL INSTR FP628

PC Tower HP Assembly (686-637)

1	686-552	TOWER HP 800 G1 ELITE I3-4330 W7
1	686-637-101	NAMEPLATE ID 628 SERIES PC
1	WARR-365	WARRANTY 12 MONTH STANDARD
1	609-787	PACK COMPONENT TWR RECEP/MOUSE

Specifications

Instrument Range*

Nitrogen, Helium model: ....0.04 to 50 mg Nitrogen

Nitrogen, Argon model:.................0.1 to 50 mg Nitrogen

Precision Range

Nitrogen, Helium model: ....0.02 mg or 0.5% RSD, whichever is greater

Nitrogen, Argon model:.................0.05 mg or 1.0% RSD, whichever is greater

Sample Mass

Up to 750 mg, 500 mg nominal

Analysis Time

4.5 minutes

Detection Method

Nitrogen: ....Thermal Conductivity (TC Cell) Detector

Gases Required

Carrier, Helium model: ....Helium, 99.99% pure @ 35 psi (2.4 bar) ±10%

Carrier, Argon model:...................Argon, 99.99% pure @ 35 psi (2.4 bar) ±10%

Combustion:................................Oxygen, 99.99% pure @ 35 psi (2.4 bar) ±10%

Pneumatic:..................................Compressed Air @ 40 psi (2.8 bar) ±10%, source must be oil and water free

Furnace

Resistance furnace; both primary and afterburner; up to 1050°C (1922°F)

Autoloader

30-position (stackable to 120 samples)

Environmental Conditions

Operating Temp:..........................15°C to 35°C (59°F to 95°F)
Humidity:....................................20% to 80%, non-condensing

Dimensions**

32 in. H x 27.5 in. W x 30 in. D (81 x 70 x 76 cm)

Weight (approximate)

Instrument ....273 lb. (124 kg)

Shipping Weight...........................324 lb. (147 kg)

Electrical Power Requirements

230 V~ (±10%; at max load), 50/60 Hz, single phase, 12 A; 4,000 BTU/hr†

*Use the following formula to calculate element concentration:
% element concentration = ((absolute element mass in mg)/(sample mass in mg))*100

**Allow a 6-inch (15 cm) minimum access area around all units.

†Average output based on nominal operating parameters.

V~ denotes VAC.

2 Installation

The Installation chapter lists step-by-step instructions to install the FP628 Nitrogen Determinator. For software setup and configuration, refer to System Setup, page 4–1.

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

Illustrations

Lifting and Moving the Instrument

Refer to Specifications, page 1–41, for the approximate shipping and instrument weight. To lift or move the instrument, use equipment capable of safely lifting this weight.

1. Properly distribute weight prior to lifting.

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.

2. Position instrument in a location convenient to power and gas supplies, providing a minimum access space of 6 inches around the instrument. The location for the instrument must also be adequately rated to support the weight of the instrument and all accessories.

Installing the Instrument

The following procedure should be used for first-time installation of the instrument. This procedure assumes that the instrument has been unpacked and positioned in its permanent location.

The balance and printer are not supplied with the instrument. They must be purchased separately. Refer to Options, page 1–34.

Refer to Figure 2-1, page 2–4, during installation of the instrument.

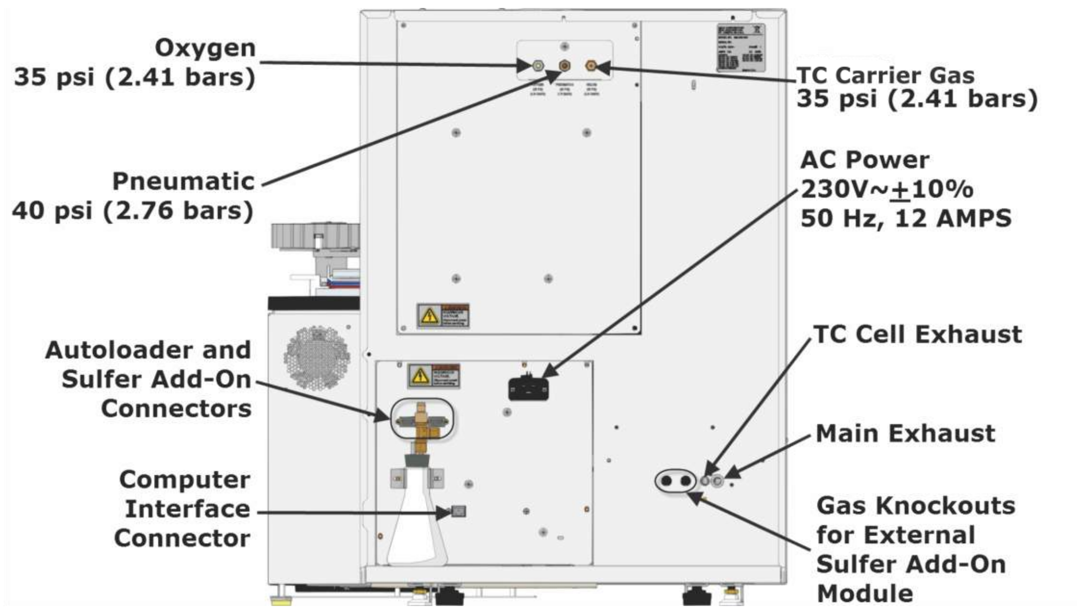


Figure 2-1
Rear Panel

1. Provide a work surface with convenient electrical power and gas supplies. Refer to Figure 2-1, page 2–4, for power and gas supply requirements.
2. Install the instrument as shown in Figure 2-1, page 2–4. Provide a minimum space of six inches around the instrument for airflow.

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.

3. Connect the AC power cord, supplied with the instrument, to the power connector on the rear of the instrument. Do not plug it into facility power. For installation outside the U.S.A., refer to International Installation, page 2–6.

4. Remove the incoming TC carrier gas flow scrubber and aliquot dose flow scrubber reagent tubes from the gas panel of the instrument and pack them. Refer to Packing the Reagent Tube, 6–43.

5. Remove the reduction heater tube from the reduction heater and pack it. Refer to Packing the Reduction Heater Tube, page 6–23.

6. Install the computer near the instrument. Refer to Installing the Computer, page 2–10.

7. Install the balance near the computer and instrument. Refer to Installing the Balance, page 3–3.

CAUTION

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

8. Connect the oxygen tubing assembly from the oxygen tank to the oxygen fitting on the rear of the instrument.

9. Slide the fitting back from the edge of the tubing and push the tubing into the oxygen port of the instrument. Then slide the nut toward the instrument and screw it onto the instrument port. Tighten the nut.

10. Turn the oxygen gas on at the tank and set it to 35 psi (2.41 bar).

NOTE If the oxygen pressure is set higher than 35 psi (2.41 bar), the ballast pressure after purging may be too high. This may result in the software skipping the method burn profile and immediately switching to maximum flow.

11. Connect the TC carrier gas tubing assembly from the carrier gas tank to the carrier gas fitting on the rear of the instrument.

12. Slide the fitting back from the edge of the tubing and push the tubing into the carrier gas port of the instrument. Then slide the nut toward the instrument and screw it onto the instrument port. Tighten the nut.

13. Turn On the TC carrier gas at the tank and set it to 35 psi (2.41 bar).

NOTE If the TC carrier gas pressure is set higher than 35 psi (2.41 bar), the depressurization at the beginning of the TC Carrier Gas Leak Check will happen slowly. This could cause a “Failed to Depressurize Leak Check” error.

14. Connect the pneumatic tubing assembly from the pneumatic tank to the pneumatic in fitting on the rear of the instrument.

15. Slide the fitting back from the edge of the tubing, and push the tubing into the pneumatic port of the instrument. Then slide the nut toward the instrument and screw it onto the instrument port. Tighten the nut.

16. Turn On the pneumatic gas at the tank and set it to 40 psi (2.76 bar).
17. Install a crucible into the into the combustion tube. Refer to Installing the Crucible, page 2–7.
18. Install the exhaust flask onto the rear panel of the instrument. Refer to Installing the Exhaust Flask, page 2–9.

NOTE Do not couple the TC cell and ballast exhaust together. Attach them to separate exhaust systems.

19. Connect the ballast exhaust on the rear of the instrument to the facility exhaust.

CAUTION

POSSIBLE OPERATOR INJURY
Ballast exhaust 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.

20. Install the Ethernet cable from the computer to the instrument. Refer to Installing the Data Transmit, page 2–11.
21. Plug the instrument into facility AC power. Do not turn On the instrument until instructed to do so.
22. This completes instrument installation. Before continuing with operation, refer to System Setup, page 4–1.

International Installation

For international installation, a HAR approved line cord for use in the end country must be obtained. This product requires a disconnect device that may either be the plug of the power cord or a disconnect device installed at the installation site if the equipment is permanently wired.

When the plug on the power supply cord is intended to serve as the disconnect device, the socket/outlet must be installed near the equipment and shall be easily accessible. When the wiring is permanently connected, a disconnect device (such as a circuit breaker or switch) must be lockable, installed near the equipment, and be easily accessible.

Combustion Tube

The combustion tube supplied in instruments purchased for domestic use is packed before shipment from the factory. Instruments purchased for international use may not have the combustion tube packed. If the combustion tube is not packed, refer to Packing the Combustion Tube, page 6–33, and pack the combustion tube.

Installing the Crucible

1. Remove the loading head and set it to the side. Refer to Replacing the Crucible, page 6–36.
2. Screw the lance extractor tool, located in the inside front door, into one of the threaded holes in the lance assembly and remove the lance assembly.
3. Insert the crucible extractor tool into a crucible and lower it into the combustion tube. Refer to Figure 2-3, page 2–8. Rest the crucible on the quartz wool packing. Release the crucible and remove the extractor tool.
4. Hold the lance by the removal tool and carefully lower it in place. Unscrew the lance extractor tool. The bottom of the lance should be positioned $^1/_4$" inside the top of the crucible. On domestic units, the combustion tube will be installed at time of installation. Verify crucible position by using the crucible installation tool to find the height of the crucible edge. Compare the height of the crucible edge to the length of the lance. Refer to Figure 2-2, page 2–7.
5. Reinstall the loading head.
6. The lance extractor tool should be stored in the inside of the front door.

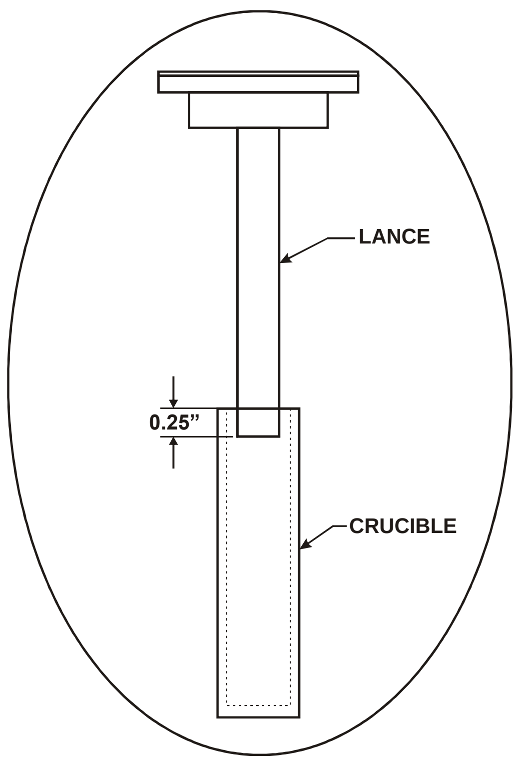


Figure 2-2
Lance Installation

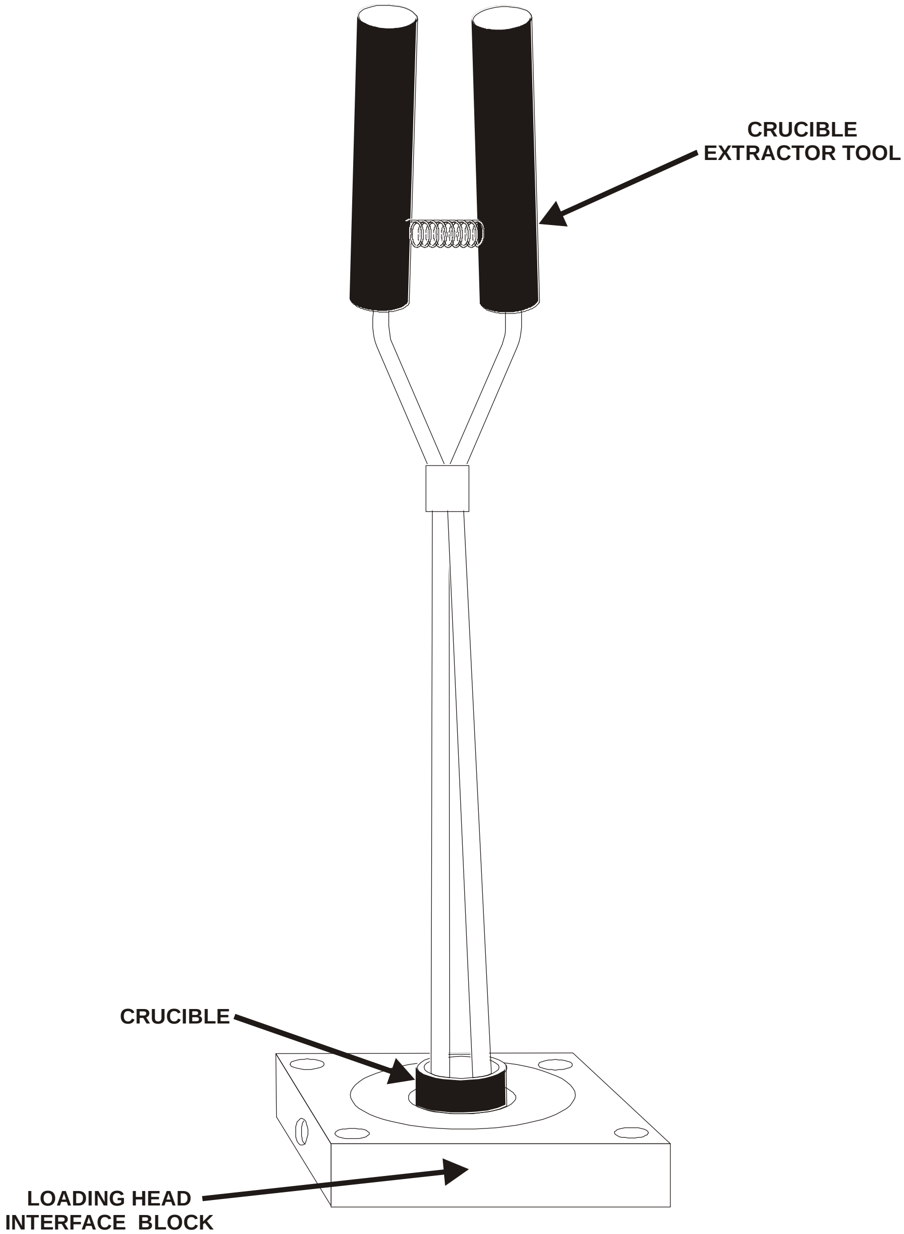


Figure 2-3
Crucible Installation

Installing the Exhaust Flask

1. Attach the exhaust flask holder to the rear of the instrument using the screws supplied. Refer to Figure 2-4, page 2–9.
2. Attach the flexible tubing from the bottom of the instrument to the long open metal tube in the top of the stopper.
3. Connect the short open metal tube in the top of the stopper to the lab exhaust using a short piece of flexible tubing.

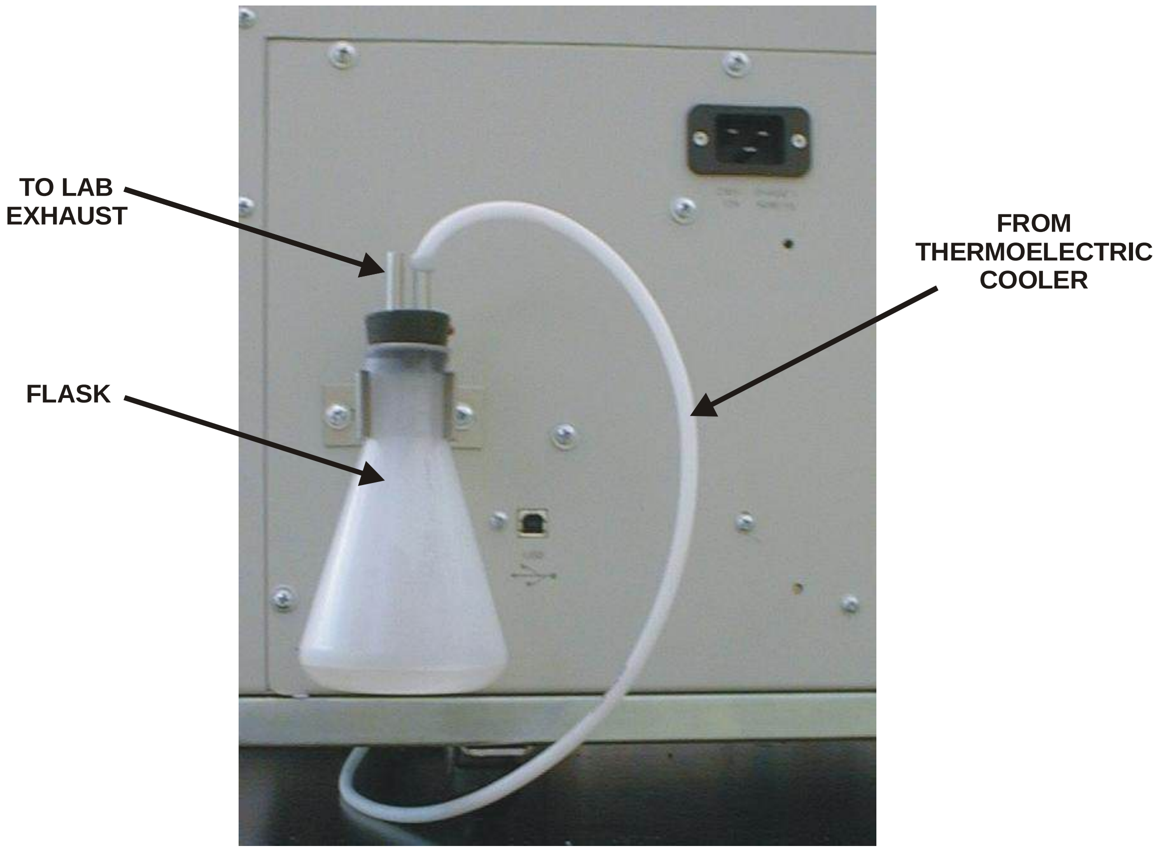


Figure 2-4
Exhaust Flask Installation

Installing the Computer

1. Unpack the computer, monitor, and printer.
2. Set the computer near the instrument, and set the monitor and printer near the computer.
3. Connect the power cord that is supplied with the monitor to the power input jack on the rear of the monitor. Refer to the manual supplied with the monitor.
4. Connect the monitor cable, supplied with the monitor, to the monitor connector on the rear of the computer.
5. Locate the instrument interface cable and connect it to the instrument connector (Ethernet) on the rear of the computer. Connect the other end to the computer connector (Ethernet) on the rear of the instrument. Refer to Configuring the Ethernet Adapter, page 9–13.
6. Locate the keyboard, supplied with the computer, and set it in front of the monitor. Connect the keyboard cable to the keyboard connector on the rear of the computer.
7. Locate the mouse, supplied with the computer, and set it next to the keyboard. Connect the mouse cable to the mouse connector on the rear of the computer. The mouse pad should be positioned under the mouse.
8. Connect the power cord, supplied with the printer, to the power input connector on the rear of the printer. Refer to the manual supplied with the printer.
9. Connect the printer cable to the connector on the rear of the printer. Connect the other end of the printer cable to the printer connector on the rear of the computer (typically this will be a USB cable).
10. Locate the copy protection key and plug it into one of the USB connectors.
11. Install the ink cartridges in the printer and align them. Refer to the manual supplied with the printer.
12. Turn the computer on and wait for the operating system to load. Select the FP628 icon and follow the registration instructions that appear on the display. Make sure the FP628 applications program has loaded and the program appears on the display before continuing.
13. Align the ink cartridges after the computer and printer have been turned On. Refer to the manual supplied with the printer for the alignment instructions.

Installing the Data Transmit

NOTE The data output is RS-232. All character generation is coded in ASCII or UNICODE format. Special characters, such as expanded print characters, are filtered out.

1. Connect the data transmit connector on the computer to the serial connector on the peripheral device.
2. Configure the instrument's output to match that of the peripheral device. Refer to Communication Settings, page 5–67, for the configuration procedure.
3. To transmit data automatically, refer to Automation, page 5–66.

Applying Power

1. The power switch on the left side of the determinator should be in the Off position.
2. Turn On the gas supplies at the regulators.

NOTE In the following steps, the determinator and computer must be turned on.

3. Turn On AC power to the determinator. Permit the computer to boot up, and run the application program after power is On.
4. Allow the instrument to stabilize until TC CELL reading for a 2 minute period is ±0.0009, usually about 1 hour, before performing a system check or sample analysis.
5. Access the ambient monitor. Refer to Ambient Chart, page 8–5.
6. Verify that there are no alarms indicated by an exclamation marker in a yellow box to the left of the parameter. All alarms must be cleared before performing a sample analysis. To clear an alarm, it may be necessary to perform hardware calibration or system maintenance or to wait an appropriate amount of time for the instrument to warm up. Refer to Diagnostics, page 8–1, and Service, page 9–1, for more information.

Carrier Gas Manifold Pressure Setting

The carrier gas manifold controls the carrier gas pressure on both the measure and reference sides of the TC cell. The carrier gas manifold is located on the left side of the unit. Remove the left panel to access the manifold.

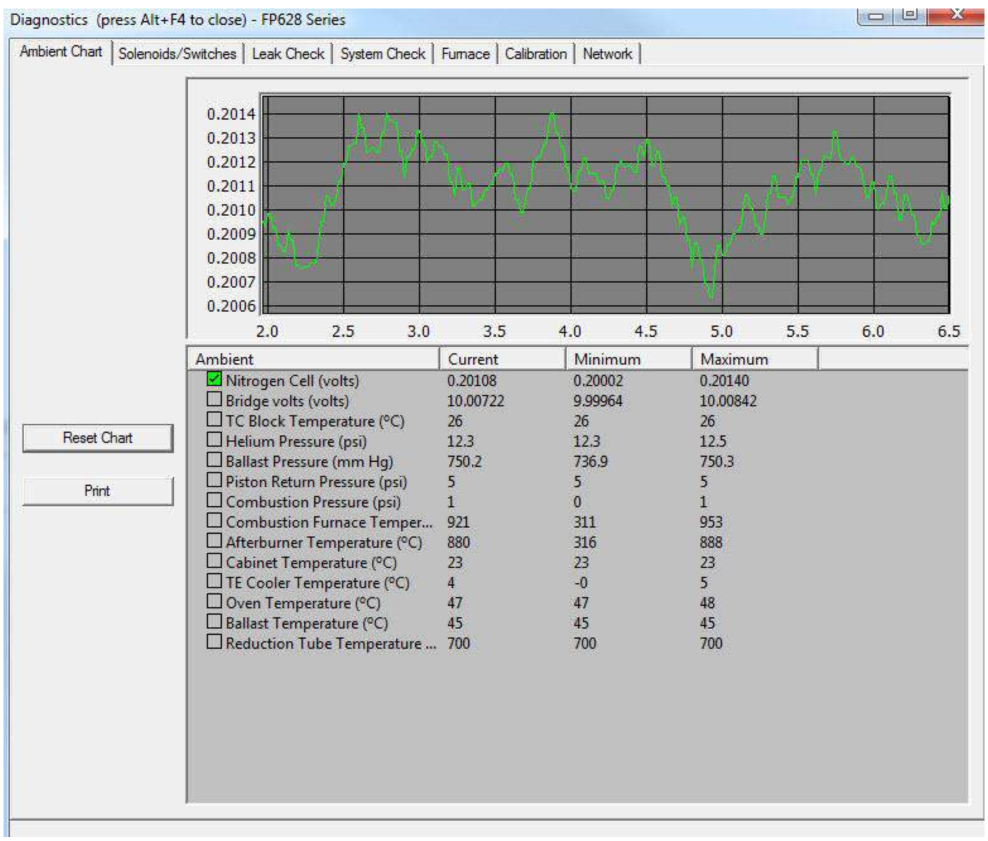
NOTE The carrier gas manifold pressure needs to be set at 12 psi for both the measure and the reference. The pressure is set during initial setup by LECO but should be checked during installation.

Setting the Carrier Gas Manifold Measure Pressure:

Turn the measure pressure knob until the pressure on the dial is at 12 psi. Refer to Figure 2-5, page 2–15.

NOTE The reference pressure is monitored in the software.

1. In the FP628 software, select Diagnostics and then select Chart.



2. Check the Helium Reference Pressure (psi) or Argon Reference Pressure (psi) box, and turn the reference knob until the reference pressure (psi) reads 12 psi.

Ambient	Current	Minimum	Maximum
☐ Nitrogen Cell (volts)	0.20109	0.20002	0.20140
☐ Bridge volts (volts)	10.00673	9.99964	10.00842
☐ TC Block Temperature (°C)	26	26	26
☑ Helium Pressure (psi)	12.3	12.3	12.5
☐ Ballast Pressure (mm Hg)	750.4	736.9	750.6
☐ Piston Return Pressure (psi)	5	5	5
☐ Combustion Pressure (psi)	1	0	1
☐ Combustion Furnace Temper...	918	311	953
☐ Afterburner Temperature (°C)	880	316	888
☐ Cabinet Temperature (°C)	23	23	23
☐ TE Cooler Temperature (°C)	4	-0	5
☐ Oven Temperature (°C)	47	47	48
☐ Ballast Temperature (°C)	45	45	45
☐ Reduction Tube Temperature ...	700	700	700

Setting the Carrier Gas Pressures at Altitude

1. Turn Off gases at the regulators.
2. In the FP628 software, select Diagnostics and then select Ambients Monitor.
3. Allow the carrier gas to reach a minimum pressure. Note this minimum.
4. Remove the left side panel.
5. Turn On gases at the regulators.
6. Turn On gases in the software.
7. Using the bottom regulator (refer to Figure 2-5, page 2–15) and, while watching the Ambient monitor, set the Carrier Gas pressure to approximately 12 psi ± 0.5 psi above the minimum pressure noted in step 3.

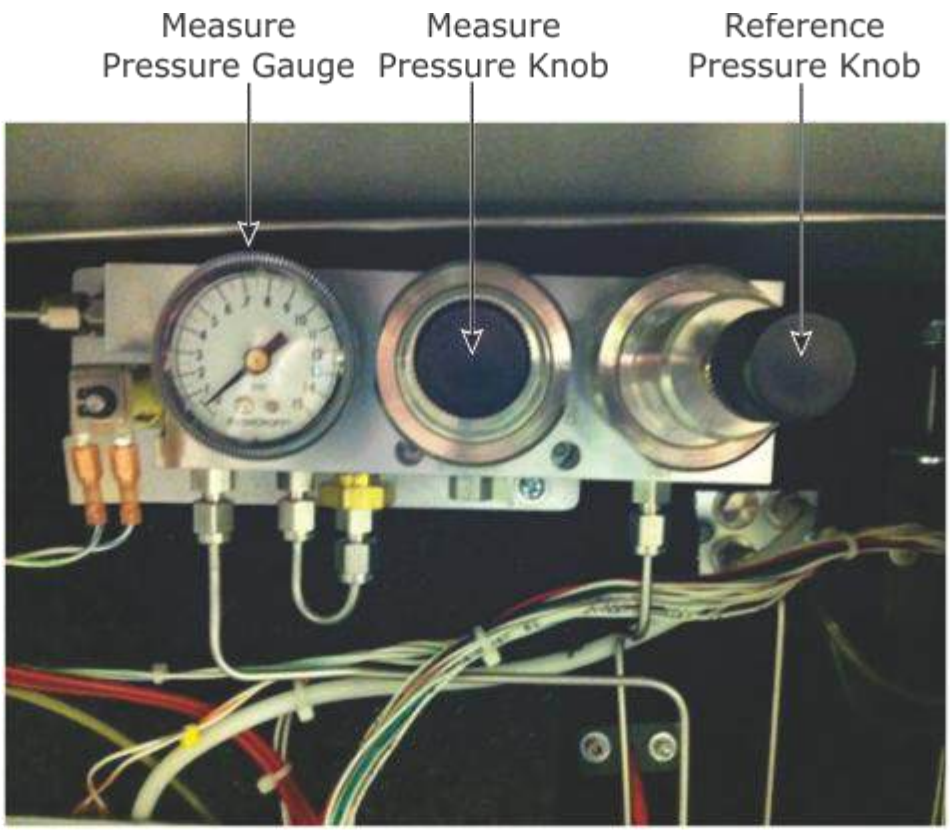


Figure 2-5
Bottom Regulator

8. Set the top regulator, using the analog display on the manifold, to 0.1 psi less than the carrier gas pressure.

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3 Option Installation

This chapter lists step-by-step instructions to install optional equipment for the FP628 Determinator. For software setup and configuration, refer to System Setup, page 4–1.

Illustrations

Installing the Balance

A Sartorius® analytical balance is available as an option. The following procedures should be performed to install a 3- or 4-place balance. For further information, refer to the manual supplied with the balance.

NOTE The instrument will only support *Sartorius* analytical balances. Other balances may be used; however, LECO is not responsible for their installation or proper operation.

After the balance is set, do not change any of the configuration parameters. The configuration parameters can be changed to custom configure the balance, but only after the installation procedure is completed and the balance is properly operating with the instrument.

NOTE To restore the balance to factory defaults, refer to Resetting the Balance, page 3–9.

1. Set up the balance in the location where it will be used. Be sure the balance location chosen is on a stable, even surface that is not exposed to vibrations. Refer to the manual supplied with the balance for more information. Refer to Preparing the Balance, page 3–4.
2. Follow the procedure in Setting the Data Characters Parameters, page 3–4.
3. Set up communication between the balance and instrument software. Refer to Setting the Data Characters Parameters, page 3–4.
4. Test the balance to ensure proper operation. Refer to Testing the Balance, page 3–9.
5. Complete the Warranty Registration Card that came with the Balance and return it to the Balance manufacturer.

Preparing the Balance

1. Unpack the balance and assemble it as shown in the manual supplied with the balance.
2. Plug the AC adapter, supplied with the balance, into facility power.
3. Connect the AC adapter cable to the power-input jack on the rear of the balance.
4. Level the balance by following the instruction manual supplied with the balance.

Setting the Data Characters Parameters

Set the data character according to the instructions in the manufacturer's manual supplied with the balance.

Figure 3-1
Balance Control Panel

Setting Up Communication with Balance

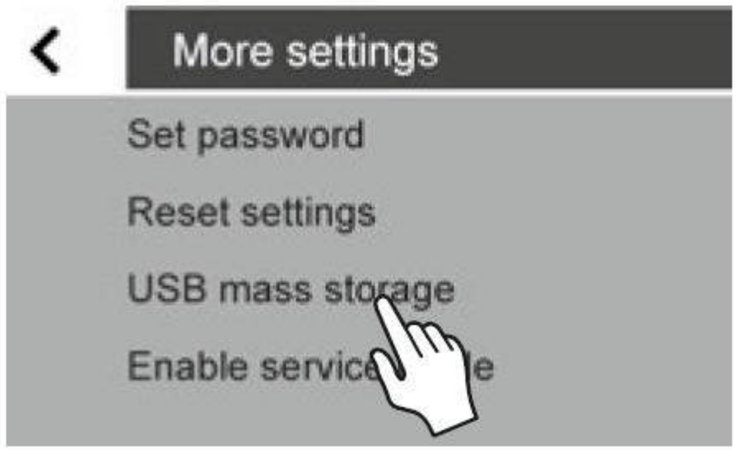
The following section explains how to set up communication between the computer and the external balance.

A driver is required to connect the balance to a USB port on the computer. The driver creates a "Virtual COM" on the computer, which emulates a serial interface (COM port). The USB Driver is stored on the balance and can be downloaded by connecting the balance to the computer with a USB Mini-B to USB Type-A cable.

NOTE If using Microsoft® Windows® XP, Service Pack 3 or above is required for the driver to install.

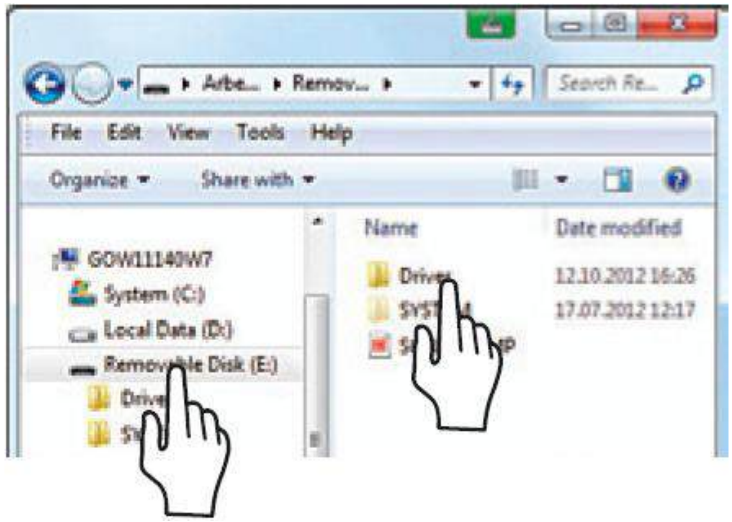
Installing the USB Driver:

1. Connect the balance to the PC using the supplied USB cable.
2. To access the balance systems settings, select (Setup) from the balance menu on the balance control panel.
3. To access the USB mass storage menu option on the balance, go to More Settings and select USB Mass Storage.

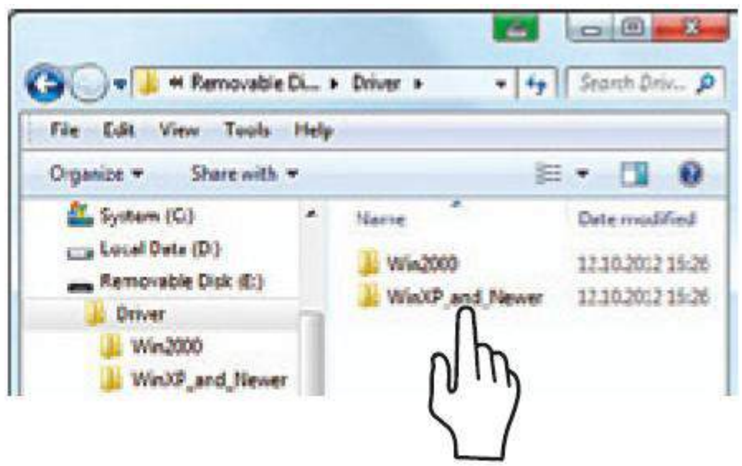


4. To connect the balance memory to the PC, select Connect.

5. To install the installation program for the USB driver on the PC, select the appropriate removable data carrier (in this case, the E: drive) and then select the Driver folder.



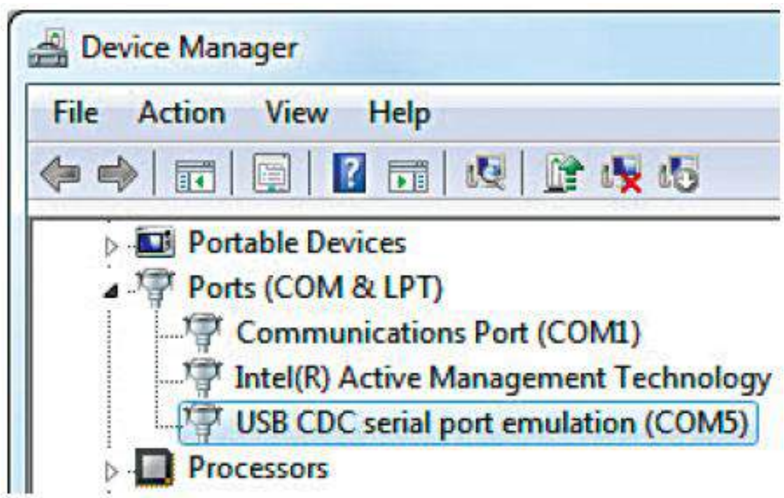
6. Select the appropriate *Windows* version for your PC and select the folder.



7. Select the file called InstallDriver.exe and follow the onscreen instructions.

8. Once the driver is installed, Direct data transfer to PC is available for both balance operating modes (PC-SBI and PC-xBPI). Select Disconnect to return to the main balance menu.

9. The USB CDC Serial Port connection appears in the Device Manager of the PC under Connections.



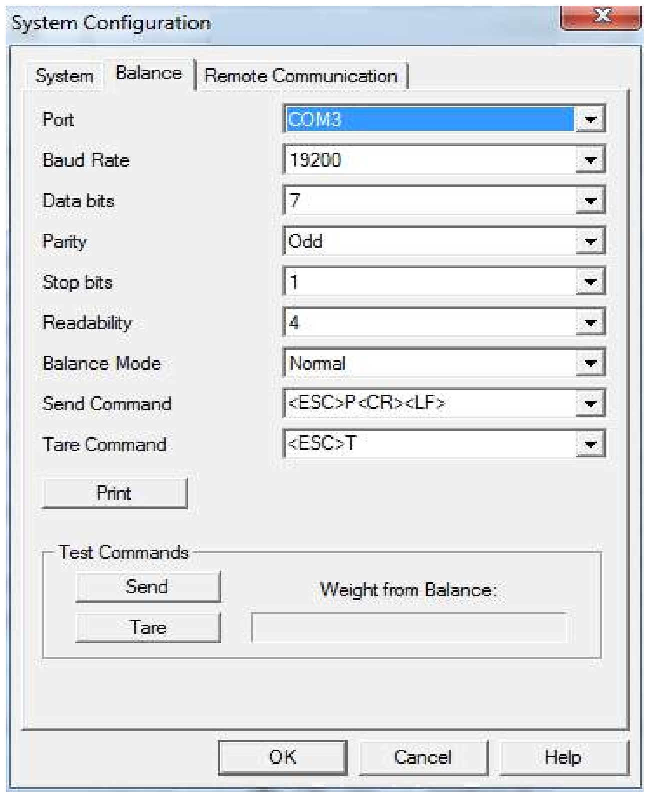
10. If the software does not recognize the balance upon installation of the driver and choosing the correct COM port, change to a different COM port, turn Off the LECO software, restart the LECO software and choose the new COM port.

Software Configuration

Select the communication port in the LECO software that was specified in step 9 of Setting Up Communication with Balance.

NOTE The following screen shot illustration is an example only and may or may not be applicable to specific procedures.

1. Go to System Configuration and then select the balance tab.



2. From the Configuration menu, click System. The System Configuration window will appear.
3. Select the Balance tab. The Balance Configuration screen will appear.
4. For Port, select the arrow and then select the port location from the list that matches the port selected on the PC tower. Default is COM1.
5. For Baud Rate, select the arrow and select the baud rate from the list. Refer to the *Sartorius* Instruction Manual. Default is 9600 bps.
6. For Data Bits, select the arrow and select the number of data bits from the list. Refer to the *Sartorius* Instruction Manual. Default is 8.
7. For Parity, select the arrow and select either odd or even. Refer to the *Sartorius* Instruction Manual. Default is Odd.

8. For Stop Bits, select the arrow and select either 1 or 2 from the list. Refer to the *Sartorius* Instruction Manual. Default is 1.
9. For Readability, the default is 4.
10. For Balance Mode, select Normal if a balance is connected to the system. Select Disabled if a balance is not connected to the system.
11. For Send Command, select the arrow and then select the desired command from the list. The default is <ESC>P<CR><LF>.
12. For Tare Command, select the arrow and then select the desired command from the list. The default is <ESC> T.
13. Select Print to print a copy of the balance parameters, if desired.
14. Use Test Commands when it is necessary to check the operation of the balance. Select Send to send a weight from the balance. When operational, the balance reading will display in the spreadsheet. Select Tare to set the balance display to zero.
15. Set the balance to manual print and "Value w/o Identifier."

    a) From the main software screen on the balance, select (Menu) and then select (Setup).
    b) Select Printout from the Settings menu and then select Manual Print from the list.
    c) Select Manual Print Format and then select "Value w/o Identifier" from the list.
    d) To return to the main menu, select the arrow in the upper left corner.

Testing the Balance

From the System Configuration menu, select System, select the Balance tab, and then select Send. The weight displayed in the Weight from Balance box should match the weight displayed on the balance.

Resetting the Balance

Refer to the manufacturer's instruction manual supplied with the balance. Consult the LECO Service Department before resetting the balance to factory defaults.

Installing the Printer

NOTE A printer is not supplied with the instrument. It must be purchased separately. Refer to Options, page 1–34, for more information.

1. Shut down and turn Off the computer system if necessary.
2. Unpack the printer and locate the printer interface cable.
3. Connect the printer to the computer. Refer to the installation instructions supplied with the printer.
4. Install the printer on the work surface and attach all necessary cables and components. Refer to the installation instructions supplied with the printer.
5. Install the printer software. This will require turning On the computer system and printer. It is not necessary to turn On the instrument at this time. Refer to the installation instructions supplied with the printer.
6. After the printer is installed and tested, turn Off the computer and printer.

Liquid Autosampler

Instructions to install and set up the Liquid Autosampler are provided in the 622-001-559 Liquid Autosampler Kit. The Instructions are LECO part number 622-001-560. For software setup, operation, and maintenance, refer to the following information.

NOTE The Liquid Autosampler should only be used with the FP628 and CN628 determinators.

Setup

System Configuration, page 4–34.

Operation

Liquid Sample Analysis, page 5–30.

Maintenance

Replacing the Duckbill, page 6–60.

Illustrations

- Liquid Autosampler- Exploded View, Figure 10-45, page 10–53.
- Liquid Loading Head, Figure 10-46, page 10–54.

Stackable Carousels

Stacking carousels increases the number of samples that can be analyzed without operator intervention. Each carousel can hold 29 samples, and up to four carousels can be stacked on the loading head.

As samples are analyzed, samples from the upper carousel drop and fill the lower carousel. Only samples from the lower carousel drop into the loading head.

1. Determine the number of carousels that are going to be used and stacked.
2. Prepare and weigh 29 samples for the first or bottom carousel.
3. Looking down into the carousel, turn the bottom plate until hole number 30 is open. Refer to Figure 3-2, page 3–12.

Figure 3-2
Carousel Open Position

4. Insert samples into holes 1 through 29 of the carousel. Do not move the bottom plate. Use this carousel for the first or bottom carousel only.

5. Without moving the bottom plate, install the carousel onto the loading head. The large and small pins on the bottom plate must align with the holes in the loading head. Do not move the bottom plate to align the holes; instead, move the entire carousel. Refer to Figure 3-3, page 3–13, and Figure 3-4, page 3–13.

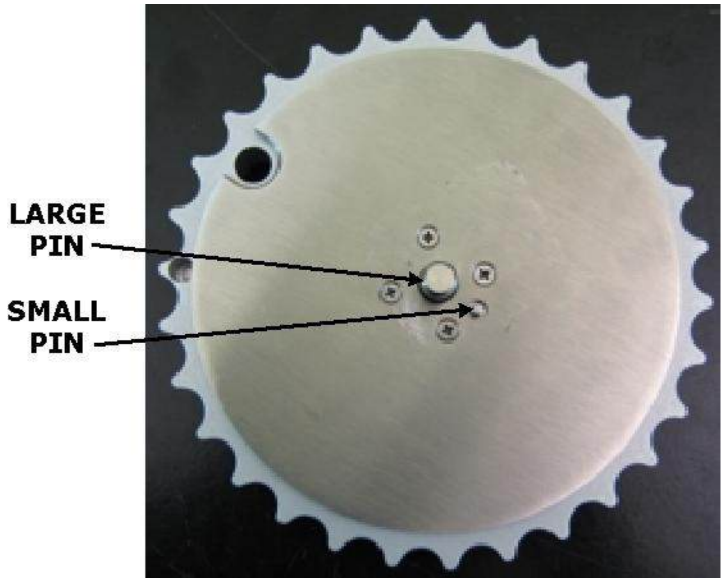


Figure 3-3
Carousel Bottom Plate

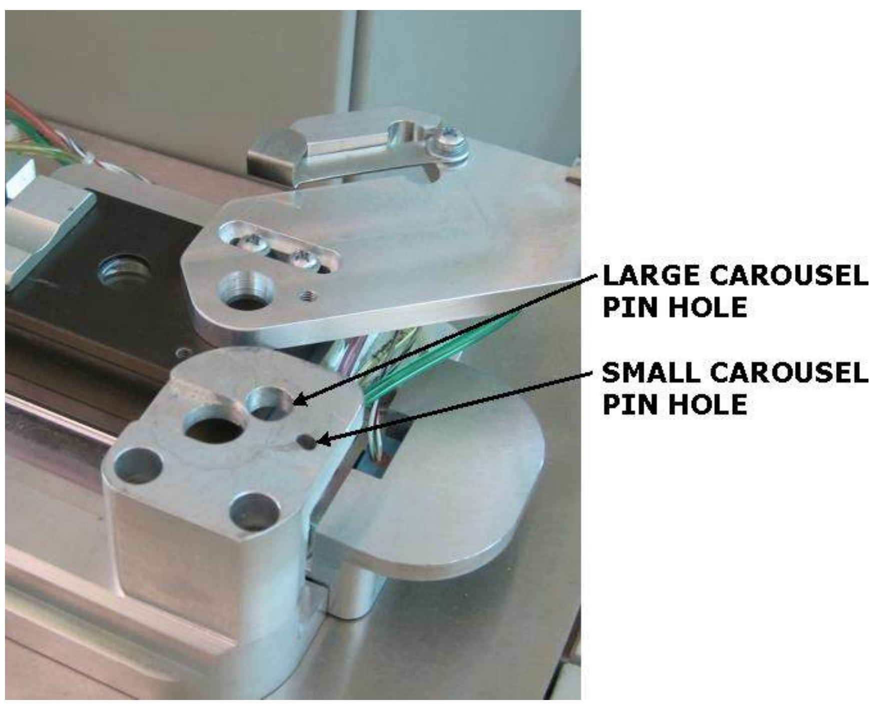


Figure 3-4
Carousel Mounting Position

6. Prepare and weigh up to 29 more samples for the second carousel.
7. Looking down into the carousel, turn the bottom plate until hole number 29 is open.
8. Insert samples into holes 30 through 28 of the carousel. Do not move the bottom plate.
9. Without moving the bottom plate, align the standoffs and install the second carousel on top of the first carousel. The standoff on the first carousel should be inserted into the hole in the second carousel, directly under the standoff in the second carousel. Refer to Figure 3-5, page 3–14.

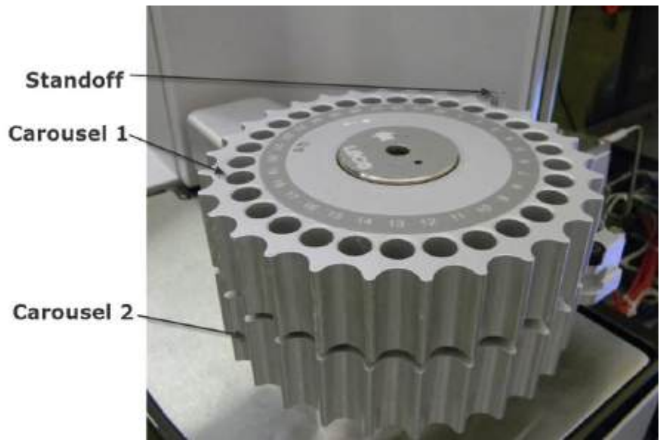


Figure 3-5
Stacked Carousels

10. To stack more carousels, repeat steps 7 through 9. For the third carousel, hole 28 should be open, and for the fourth carousel, hole 27 should be open. As the samples drop into the first carousel, they will be in the correct numerical order.
11. Enter the sample information into the spreadsheet. Ignore the sample position numbers on the carousels. In consecutive order, number the samples in the spreadsheet from 1 to the highest sample number.

NOTE If operation is intermittent with the weight of four carousels, perform the procedure outlined in Carousel Alignment, page 9–41.

4 System Setup

The System Setup chapter explains how to set the operating parameters for a specific application or set of applications. These procedures should be done before any samples are analyzed for the first time per application.

NOTE The numbers used for the screen shot examples in this manual are only to illustrate operation and may or may not be applicable to specific procedures.

Illustrations

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Front Panel Controls and Functions

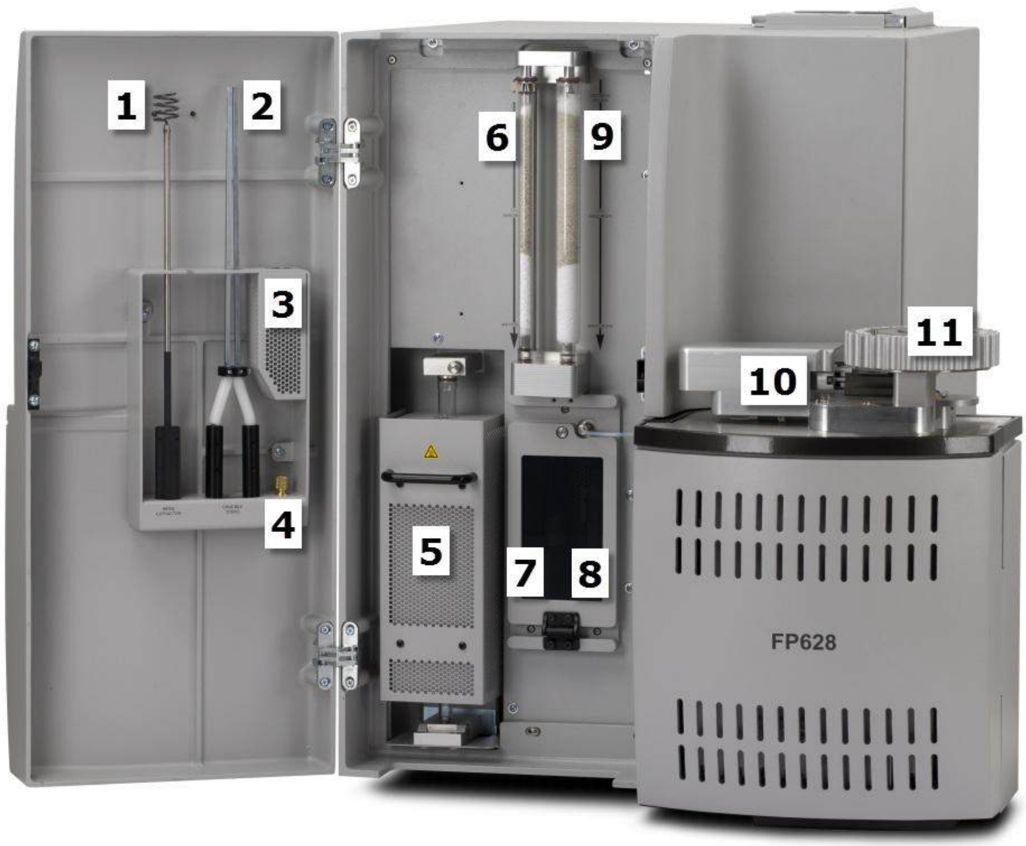


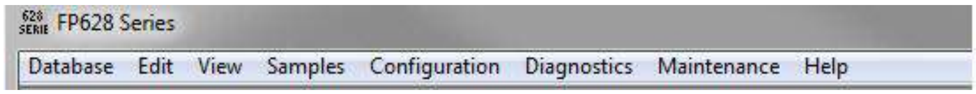
Figure 4-1
Front Panel Controls and Functions

Number	Item	Description
1	Quartz Wool Extractor Tool	Used to remove and replace quartz wool in the combustion tube.
2	Crucible Extractor Tool	Used to remove and replace the crucible.
3	Storage for Lance Assembly	Used to store lance assembly.
4	Lance Removal Tool	Used to remove the lance assembly.
5	Catalyst Heater Assembly	Removes oxygen and changes NO_x to N_2 before the sample gas enters the TC cell.
6	Aliquot Dose Reagent Tube	Purifies the gas leaving the aliquot doser and catalyst heater by removing CO_2 and moisture.

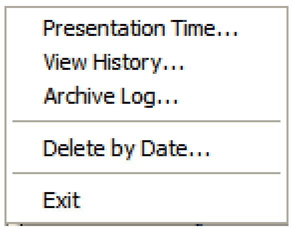
Number	Item	Description
7	Furnace Particle Filter (Balston Filter)	Removes debris particles that may not have been trapped in the furnace filter.
8	Furnace Filter (Steel Wool)	Filters the gases leaving the furnace and entering the thermoelectric cooler. Any particles leaving the furnace are trapped in the filter.
9	Incoming TC Carrier Gas Scrubber Reagent Tube	Purifies the incoming carrier gas by removing CO_2 and moisture.
10	Loading Head Assembly	During analysis, a sample is placed in the loading head and automatically drops into the furnace for analysis.
11	Sample Carousel	Used to load samples for analysis.

Menu Overview

The following are the menu choices in the Microsoft® Windows® software. Selecting on any of these will open another set of menu choices.



Database Menu



Presentation Time—Refer to Presentation Time, page 4–88.

View History—Refer to View History, page 4–89.

Archive Log—Refer to Archive Log, page 4–90.

Delete by Date—Refer to Deleting Analyzed Samples, page 4–94.

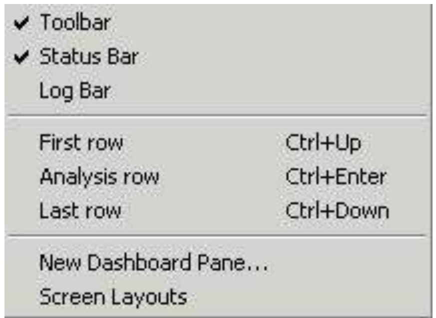
Exit—Used to exit the application program and return to the *Windows* Operating System.

Edit Menu

Insert—Inserts a sample out of sequence, between unanalyzed samples, into the spreadsheet for analysis. Refer to Insert a Sample, page 5–42, for additional information.

Fill—A group of cells in the spreadsheet can be quickly filled with the same data. Refer to Filling Cells with the Same Data, page 5–42, for additional information.

View Menu



Toolbar—Toggles the toolbar Off or On. Refer to Hide/Show the Toolbar, page 4–32, for additional information.

Status Bar—Toggles the status bar Off or On. Refer to Hide/Show the Status Bar, page 4–32, for additional information.

Log Bar—Displays messages that are added to the log file. Refer to Log Bar, page 4–32, for additional information.

First Row—Automatically selects the first row of data in the spreadsheet. Refer to Go to First Row in the Spreadsheet, page 4–33, for additional information.

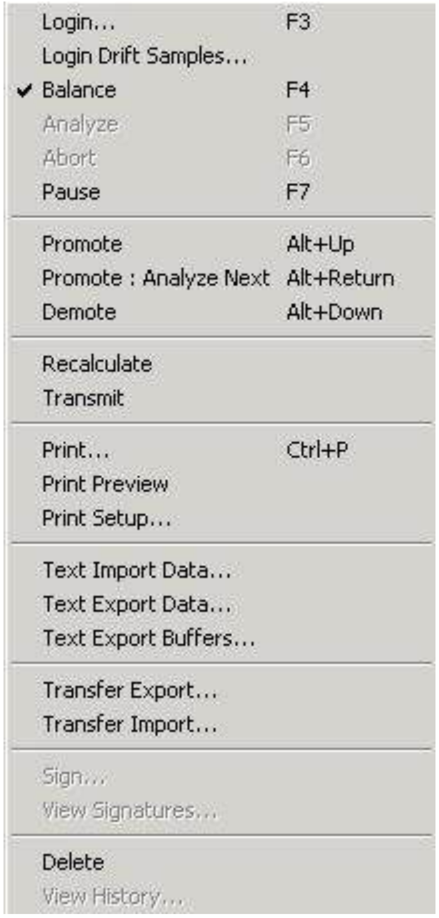
Analysis Row—Automatically selects the analysis row of data in the spreadsheet. Refer to Go to Analyze Row in the Spreadsheet, page 4–33, for additional information.

Last Row—Automatically selects the last row of data in the spreadsheet. Refer to Go to Last Row in the Spreadsheet, page 4–33, for additional information.

New Dashboard Panel—Permits the operator to create or edit the properties of the dashboard. For more information, refer to Creating a Dashboard Panel, page 4–26.

Screen Layouts—Permits the operator to save a screen layout after configuration. By saving the screen layout, the operator can return to a previous screen layout quickly. Screen layouts can be saved for specific applications. Refer to Screen Layouts, page 4–31.

Samples Menu



Login—Used to log a sample or a standard into the spreadsheet. Refer to Sample Login, page 5–19, for additional information.

Login Drift Samples—Used to log a drift sample into the spreadsheet. Refer to Sample Login, page 5–19, and Drift Correction, page 5–37, for additional information.

Balance—Used to enter a mass from the balance into the sample login screen. Refer to Entering a Mass from the Balance, page 5–23, for additional information.

Analyze—Displays the sample login screen to log in and analyze a sample, analyze a standard, or analyze multiple samples. Refer to Analyzing a Sample, page 5–24, for additional information.

Abort—Used to stop or abort an analysis. Refer to Aborting an Analysis, page 5–25, for additional information.

Pause—The operator can stop or pause analysis at a selected sample and then resume at a programmed date and time. Refer to Pausing Analysis, page 5–28, for additional information.

Promote—Moves an unanalyzed sample within the sample list up the list toward the next sample to be analyzed.

Promote: Analyze Next—Moves an unanalyzed sample within the sample list up the list and positions it as the next sample to be analyzed.

Demote—Moves an unanalyzed sample within the sample list down the list toward the last sample to be analyzed.

Recalculate—After an analysis is complete, recalculate results can be used to recalculate the result if the extraction data or calibration has changed. Refer to Recalculating Results, page 5–43, for additional information.

Transmit—Transmit selected samples and transmit selected analyzed samples with a data format to a host computer. Refer to Transmitting Selected Samples, page 5–71, for additional information.

Print—The print command accesses the report settings dialog box to print selected sample results on the system printer. Refer to Printing Reports, page 5–48, for additional information.

Print Preview—The print preview command accesses the report settings dialog box to preview how selected samples would print on the system printer.

Print Setup—Print Setup permits the operator to configure the printed page. The choices and functions will depend on the printer in use.

Text Import Data—Used to import sample data from another software application. Refer to Text Import Data, page 5–62, for additional information.

Text Export Data—Used to export sample data to another storage location, like a floppy disk. Refer to Export Text Data, page 5–48, for additional information.

Text Export Buffers—Used to export selected sample plot data to a file or another application. Refer to Export Text Buffers, page 5–61, for additional information.

Transfer Export—Used to Export Sample Data to a File. The file can be saved on the system's hard drive or transferred to another media for safe storage. Refer to Transfer Export, page 5–72, for additional information.

Transfer Import—Used to Import Sample Data from a File and restore it in the spreadsheet. The file had to be saved using Export Sample Data to a File. Refer to Transfer Import, page 5–74, for additional information.

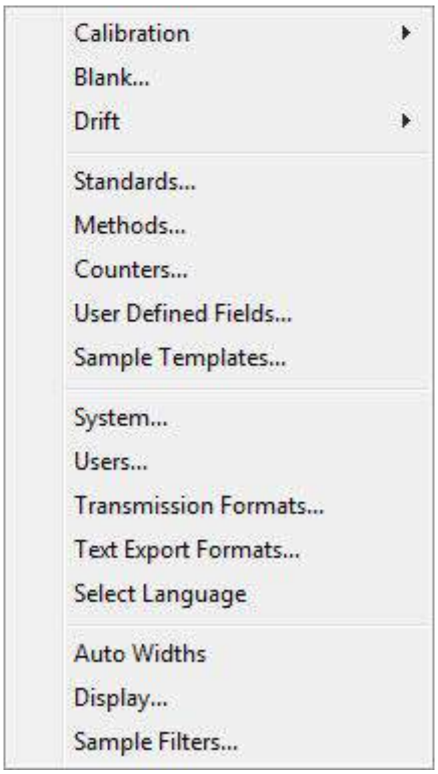
Sign—Used to add a signature to a sample that ensures the validity of the sample information has remained the same since it was signed. Refer to Sample Signature, page 5–46, for additional information.

View Signatures—Used to view a sample signature and determine if it is valid. Refer to Viewing Signatures, page 5–47, for additional information.

Delete—Delete a sample removes a selected sample with sample data from the spreadsheet. Refer to Deleting a Sample, page 5–43, for additional information.

View History—Used to look at a history log of the actions performed on a selected sample. Refer to Viewing History, page 5–45, for additional information.

Configuration Menu



Calibration—Matches the response of the instrument to known calibration samples. Refer to Calibration, page 5–33, for additional information.

From the Calibration fly-out menu, the operator can select New Standard Calibration, page 5–35, Add Standards, page 5–36, View Calibration, page 5–36, and Edit Calibration, page 5–37.

Blank—Determines the amount of blank and adjusts the calibration (area) accordingly. Refer to Blank Calibration, page 5–34, for additional information.

Drift—Adjusts the original calibration response to match the current instrument response. Refer to Drift Correction, page 5–37, for additional information.

From the Drift fly-out menu, the operator can select Drift Correction, page 5–37, Viewing History, page 5–39, and Replacing Drift Standard, page 5–40.

Standards—Used to enter standards into the calibration standards list. Refer to Logging in using Calibration Reference Material, page 4–63, for additional information.

Methods—Used to create a method for analysis. Refer to Creating and Modifying a Method, page 4–48, for additional information.

Counters—Automatically determines when periodic maintenance is necessary. Maintenance data that was entered to log in periodic maintenance is used by the counters to determine when maintenance is necessary. Refer to Configuring Maintenance Counters, page 6–57, for additional information.

User Defined Fields—Permits the operator to add a unique field to the spreadsheet and sample login screen. The field can include a formula for calculation or contain only text. Refer to User Defined Fields, page 4–71, for additional information.

Sample Templates—A quick way for the operator to log in a sample and enter a method, comment, and description. Create a sample template is used to develop a specific sample template. After a sample template is developed, use sample template to log in a sample with predetermined sample analysis data. Refer to Sample Templates, page 4–65, for additional information.

System—Configure system sets the overall instrument operating settings to configure the instrument for a specific application or set of applications. Refer to System Configuration, page 4–34, for additional information.

Users—Determines which operators can use the instrument and which functions they can use. Refer to Determining User Permissions, page 4–19, for additional information.

Transmission Formats—Before data can be transmitted to a host computer, the transmitted data format must be configured to match the host requirements. Use transmission formats to configure data transmission. Refer to Transmitting Format Configuration, page 5–63, for additional information.

Text Export Formats— Permits the operator to select sample data and export that data to a file. Refer to Export Text Data, page 5–59, for additional information.

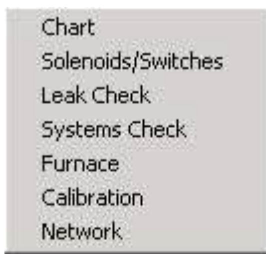
Select Language—Permits the user to Selecting Language, page 4–18, of the software. A list of available languages will be displayed.

Auto Widths—Automatically adjusts the width of each cell to fit the text. For instructions, refer to Auto Widths, page 4–33, for additional information.

Display—Sets the desktop characteristics as viewed on the computer monitor. Refer to Display Configuration, page 4–23, for additional information.

Sample Filters—Sample Filters is used to display sample data based on a predefined requirement. Refer to Sample Filters, page 4–68, for more information.

Diagnostics Menu



Chart—Select Chart to monitor the System Operating Parameters, and display the Ambient Monitor as a Chart and Graph. All parameters can be displayed. Refer to Ambient Monitor, page 8–5.

Solenoids/Switches—Select Solenoids/Switches to toggle the solenoid valves to verify proper operation, diagnose instrument problems, and perform periodic maintenance. Refer to Solenoids and Switches, page 8–32.

Leak Check—Select Leak Check to determine if the instrument has an oxygen or carrier gas leak. Refer to Leak Check, page 8–19.

System Check—System Check permits the operator to automatically check Network Communications, Solenoid Operation, Pneumatic Pressure, System Pressure, Temperature, Gas Flow, and IR and TC Cells. Refer to System Check, page 8–30.

Furnace—Select Furnace to test and monitor the furnace for proper operation. Refer to Furnace Diagnostics, page 8–16.

Calibration—Select Calibration to set the barometric pressure, calibrate the combustion flow, adjust the TC cell and perform a backup calibration. Refer to Calibrations, page 8–9.

Network—Select Network to test the Electronic Assemblies and upgrade firmware. Refer to Network Diagnostics, page 8–13.

Maintenance Menu

Login—Used to log in periodic maintenance after it was performed. Refer to Logging in Periodic Maintenance, page 6–55, for additional information.

View Log File—The system will automatically keep a record of various procedures that were performed. The record can be viewed using view log file. Refer to Viewing Log File, page 6–56, for additional information.

Instrument Shutdown—Used to shut down the instrument.

Applying Power

1. The power switch on the right side of the instrument should be in the Off position.
2. Connect the instrument to the proper electrical power source if it was not done during installation. Refer to Installing the Instrument, page 2–4 for addition information.
3. Turn the gas supplies On with the regulators at the gas tanks. The oxygen and helium or argon should be set to 35 psi (2.41 bar). The pneumatic should be set to 40 psi (2.76 bar).
4. Turn On AC power to the instrument and computer. Permit the computer to boot up and run the application program.
5. Allow the temperature to stabilize for one hour before performing a system check or sample analysis.
6. Access the ambient monitor. Refer to Ambient Chart, page 8–5.
7. Verify that there are no alarms indicated by an exclamation marker in a yellow box to the left of the parameter. All alarms must be cleared before performing a sample analysis. To clear an alarm, it may be necessary to perform hardware calibration OR system maintenance or to wait an appropriate amount of time for the instrument to warm up. Refer to Diagnostics, page 8–1, and Service, page 9–1, for more information.

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.

8. Perform a System Check to determine if the instrument is operating properly. Refer to System Check, page 8–30.
9. Perform a Whole Oxygen Leak Check and a Whole Carrier Gas Leak Check. Refer to Leak Check, page 8–19.

Selecting Language

Select Language permits the operator to select the software language. The available choices appear on the screen.

Although the language of the software will change, the onboard manual will remain in English.

The list of languages displayed in the following screen shot is used as an example and may vary from the actual languages displayed on your computer monitor.

1. From the Configuration menu, choose Select Language. The Select Language dialog box will appear.

2. Select the language desired.
3. Select OK. Software will convert to language chosen.

Determining User Permissions

Users on the Configuration menu helps prevent unauthorized operation by permitting the system administrator to assign permission for users to perform selected functions in the instrument software. The following section explains how to add users to the *Windows* OS (Operating System) on the local PC and how to add users to the instrument through a network/domain login.

Adding User in *Windows* OS

To add a user, refer to the *Windows* OS help system as follows:

1. From the desktop, select Start and then select Help. Help may be referred to as Help and Support depending on the *Windows* OS that is used.
2. In the search box, type Users and Passwords.
3. Make a selection from the Users and Passwords options list, select Display and follow the instructions provided.

Adding Users to Instrument Software

The following section explains how to add users to the instrument software. This procedure applies when a user is not assigned in the *Windows* OS on the local PC but will be logging onto the instrument through a network/domain login.

1. On the Configuration menu, select Users. The Users dialog box will appear.
2. On the Users dialog box, select Add. The word “User” will appear under Name.
3. Select User and type in the network/domain login for the user. If the user identification entered here does not match the required network/domain login for the user to log on to the PC from a network, the user will not have the permissions designated in the software.
4. Refer to Adding or Changing User Permission for Instrument, page 4–21, for instructions to assign permissions to individual users.

Changing Users in *Windows* OS

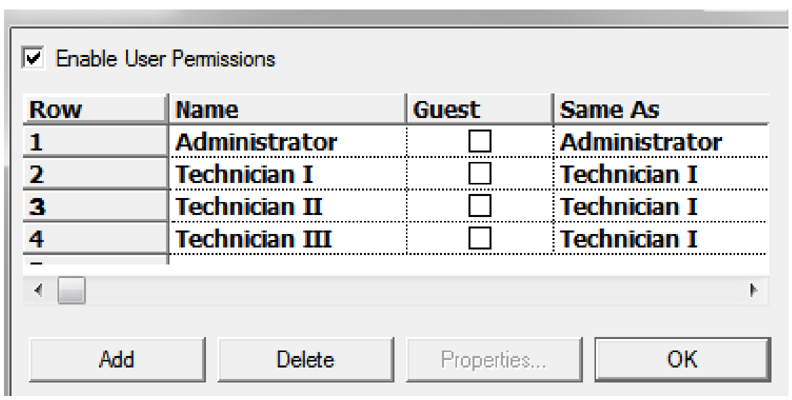
The following section explains how to change users. This procedure applies both to users assigned in *Windows* and to users added to the instrument on a network/domain login.

1. Close the software.
2. On the desktop, select Start and then select Log Off. This step will vary depending on the *Windows* OS that is used.
3. Enter the username and password to log on the new user. This step will vary depending on the *Windows* OS that is used.
4. Log in to the instrument.

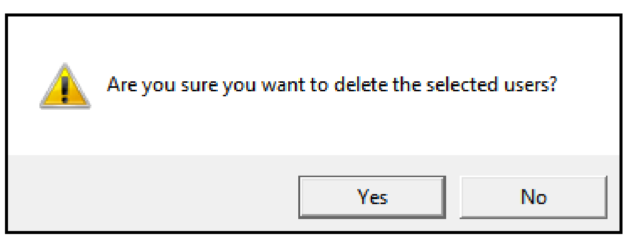
Deleting Users in the Instrument Software

Only users added to the instrument on a network/domain login can be deleted. Users assigned in the *Windows* OS cannot be deleted from the Users dialog box.

1. Select Configuration and select Users. The Users screen will appear.



2. Select the name to be deleted and then select Delete. A message dialog box will appear.

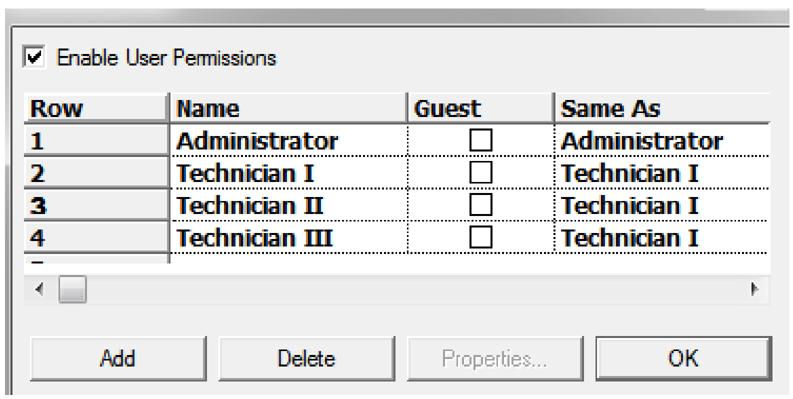


3. Select Yes to delete the username; select No to keep the username.

Adding or Changing User Permission for Instrument

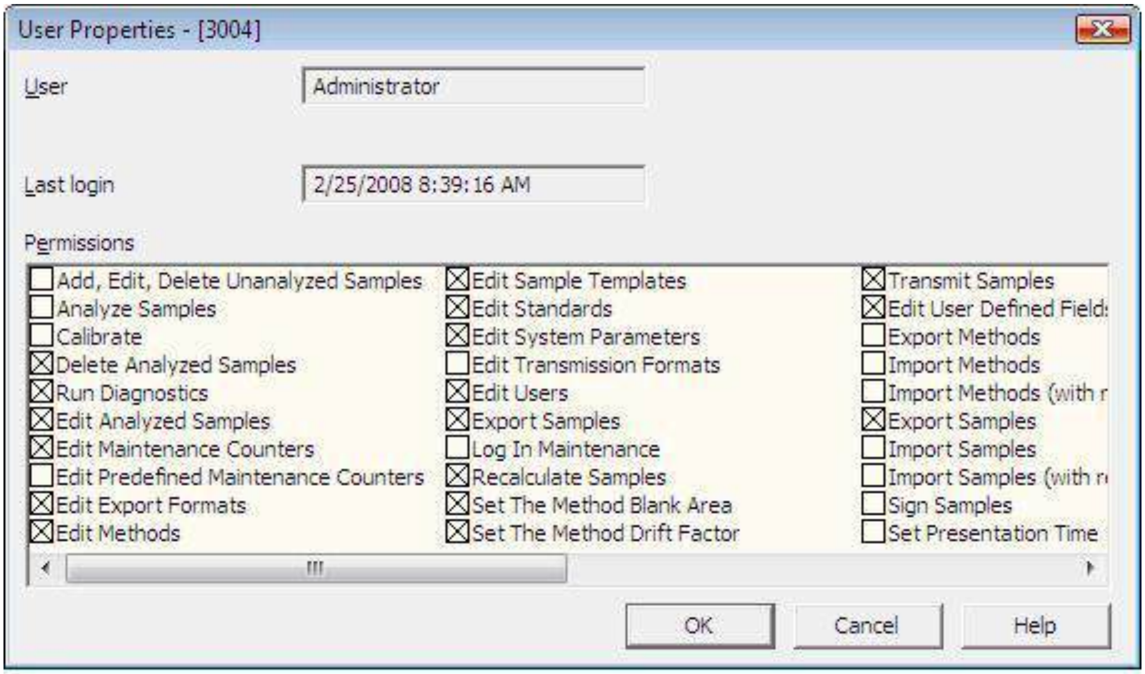
Users’ names will appear in the Name column of the Users dialog box. The current user logged into the *Windows* system will display in blue.

1. Select Configuration and select Users. The Users screen will appear.
   - A. To disable all user permissions for a specific user, place an X in the Guest column. When the user logs on to the system, they will be considered a Guest and will have READ-ONLY access to the software. For Guest users, the checkboxes listed on the User Properties dialog will be cleared as they cannot perform any of the tasks listed.
   - B. Select the Enable User Permissions checkbox and user permissions will be checked during the operation of the instrument. When the Enable User Permissions checkbox is cleared, user permissions are not checked and all users can perform any function on the instrument.
2. To assign user permissions, select the name of a user.



3. If one user requires the exact same permissions as a user that already has permissions assigned, the Same As column can be used to save time.
   - A. Select the name of the user to add or change permission by selecting in the Row column for that user.
   - B. Single-click in the Same As column.
   - C. From the list, select the name of the user that already has the same permissions assigned.

4. Select Properties. The User Properties dialog box will appear.



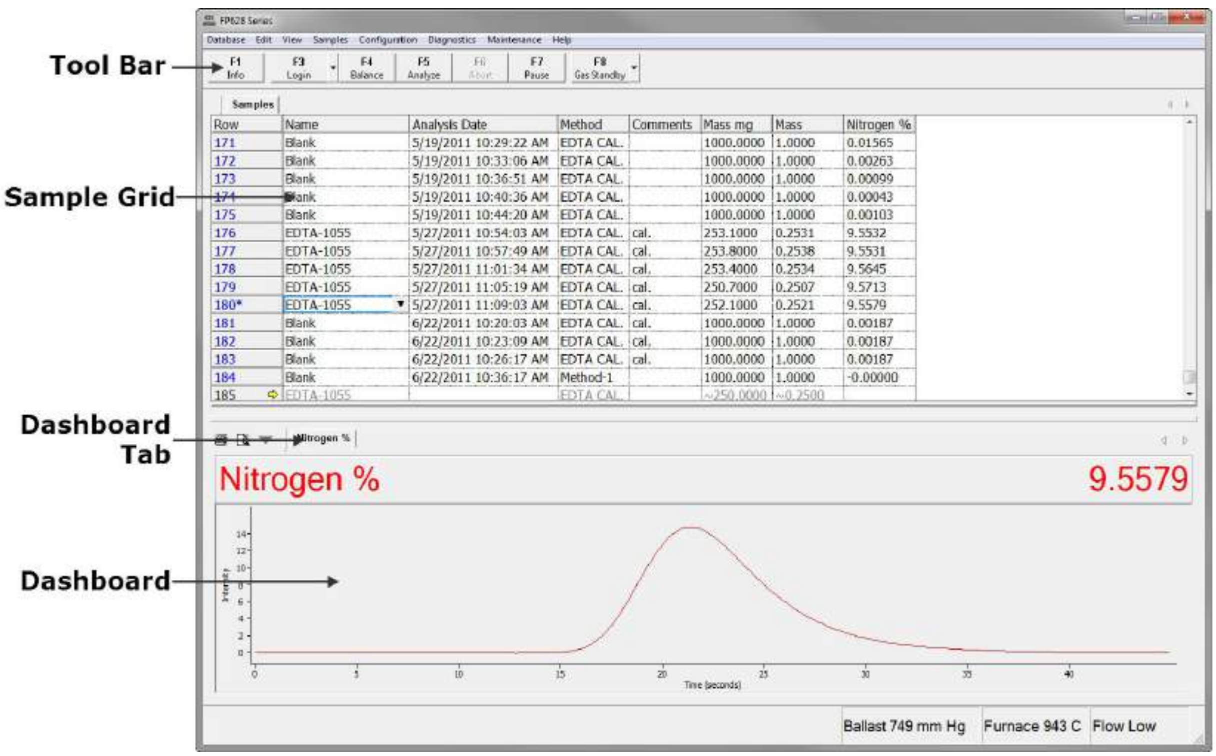
5. Select the desired checkboxes to assign or remove user permission for the functions listed in the edit box. When an X displays, the user has permission to perform that function.

6. Select OK when finished assigning permissions.

Display Configuration

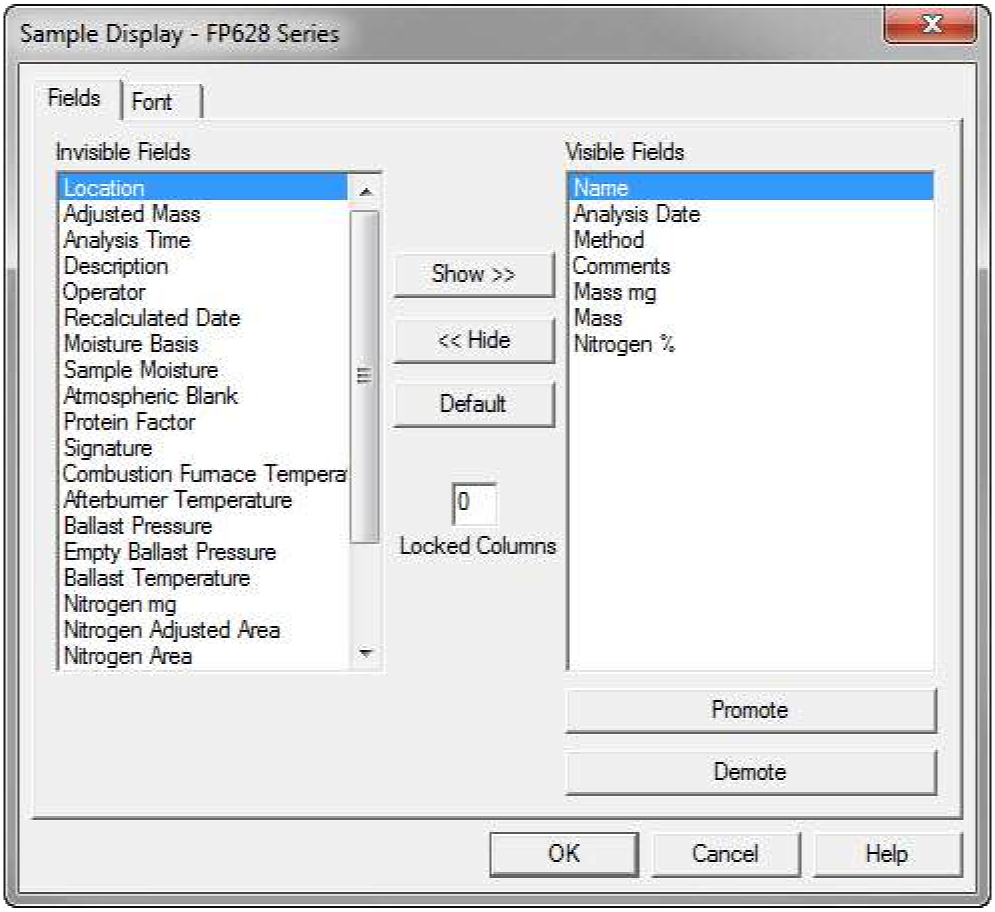
Main Screen Overview

The main screen appears when the determinator and computer are powered up. A screen example of the default configuration is shown in the following screen shot. Like many *Windows* based programs, the screen can be configured by the operator as desired. Screen layouts or configurations can be saved and recalled.



Configuring Fields

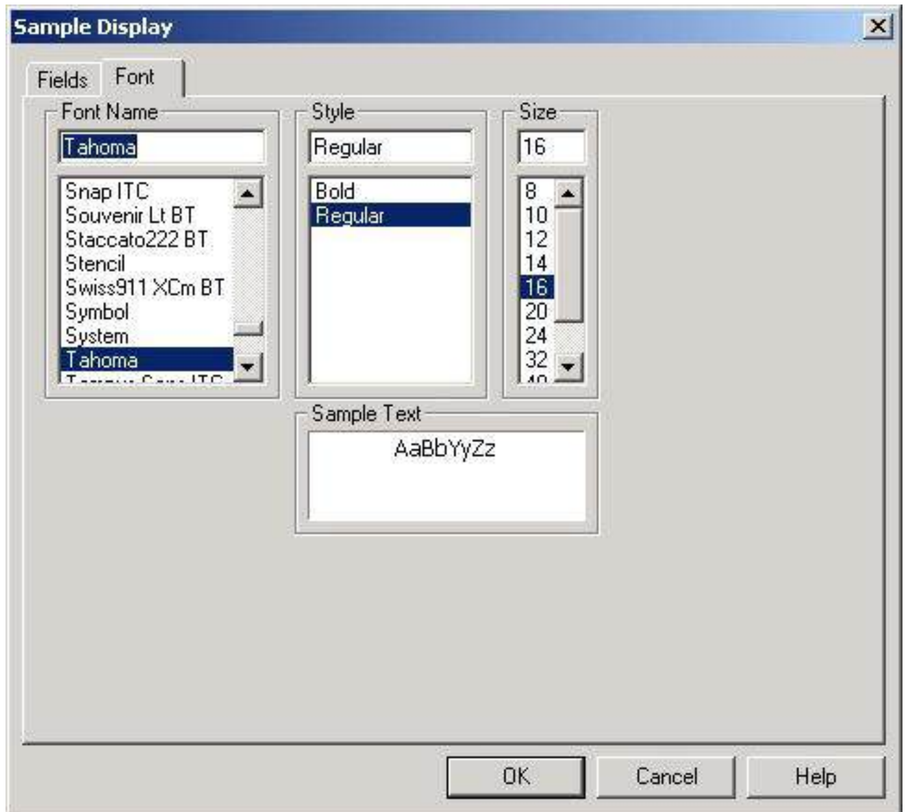
1. From the Configuration menu, select Display. The Sample Display screen will appear.



2. Select Fields to display or hide a field.
3. To show an invisible field, select the field to display and select Show.
4. To hide a visible field, select the field to hide and select Hide.
5. To change the order of fields shown on the spreadsheet, select the field to move in the Fields List box and select either Promote or Demote.
6. Select Default to list the default fields as Visible Fields.
7. Select the Locked Columns box and enter the number of columns to lock in place. The columns are numbered from top to bottom under visible fields. When a column is locked, it will not change position in the spreadsheet.

Configuring Font

1. Select Font to change the font name, style, size, and color. The Font configuration screen will appear.

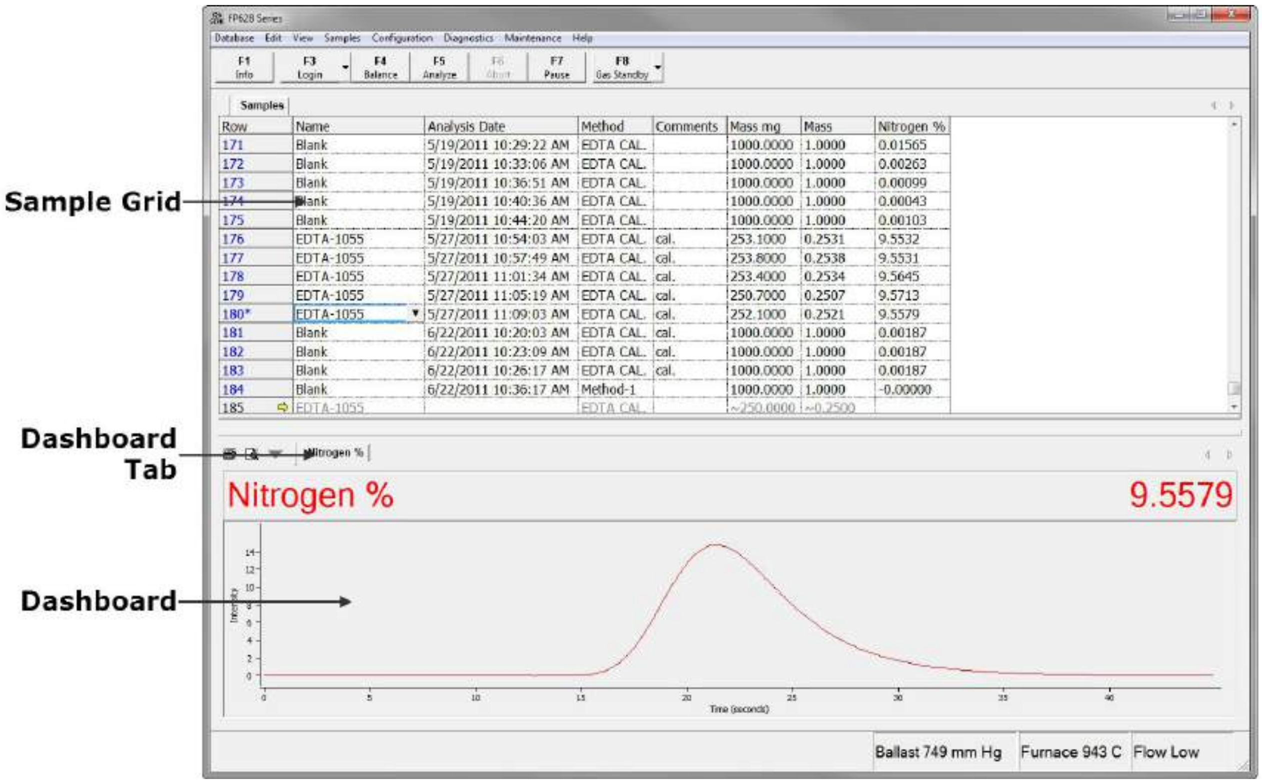


2. From the Font configuration screen select the Font Name, Style, and Size. A sample of the selected Font will appear in the Sample Text preview box.

Creating a Dashboard Panel

The Dashboard Panel can display an element plot or element values. Refer to Single Sample Selected, page 4–27.

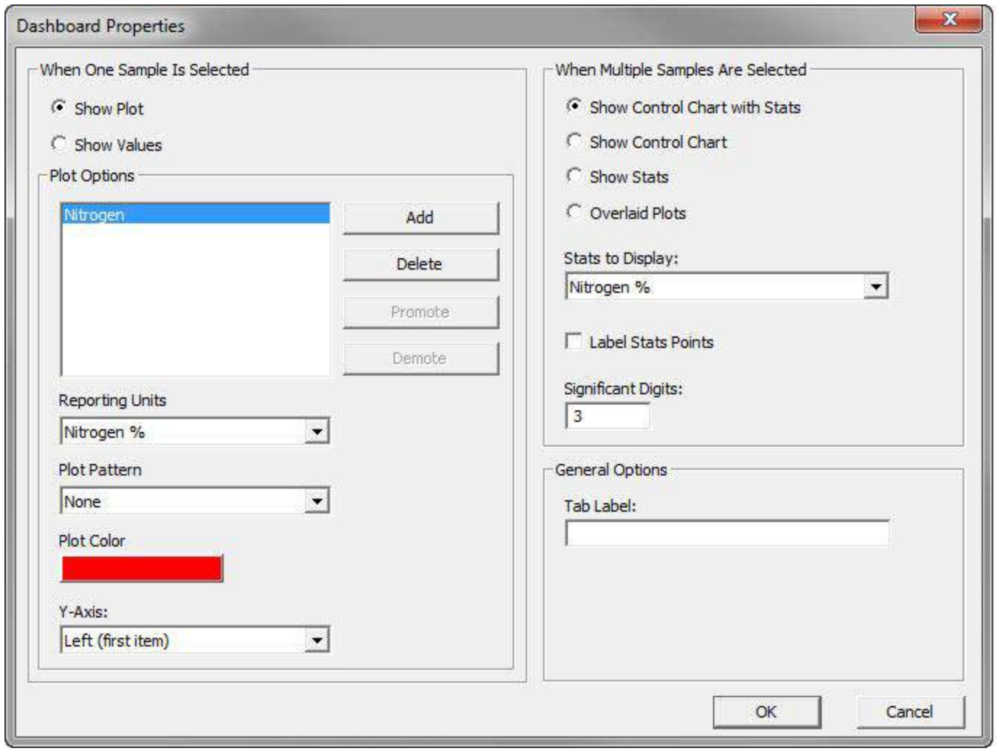
The dashboard display will automatically change depending on the number of samples selected. Refer to Multiple Samples Selected, page 4–29.



Single Sample Selected

Showing an Element Plot in the Dashboard

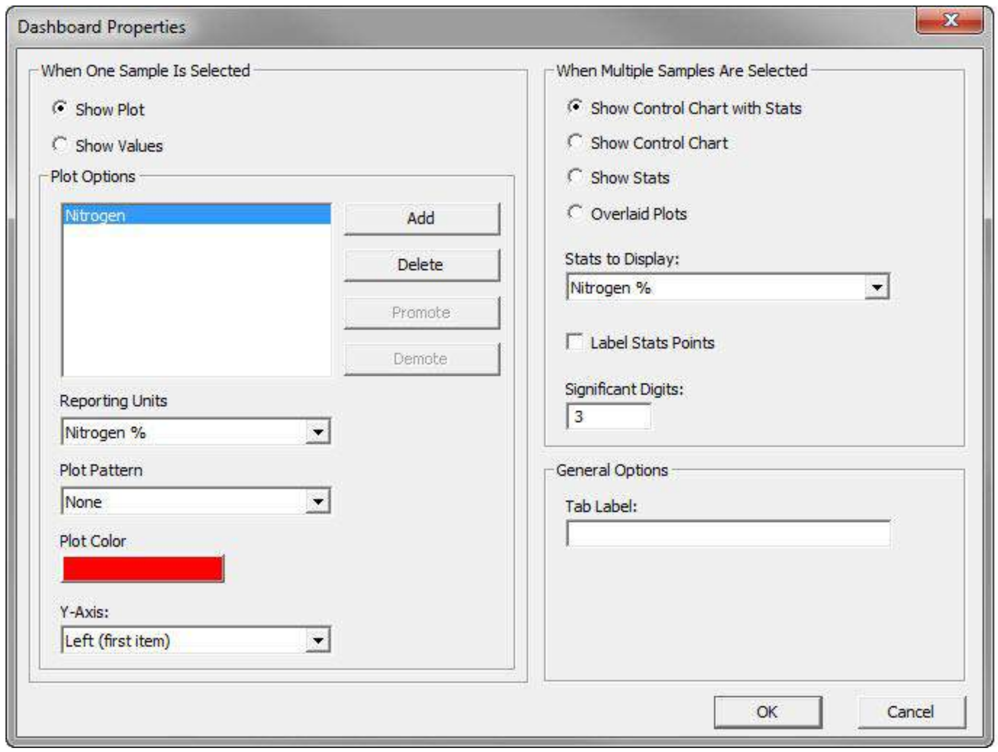
1. From the View menu, select New Dashboard Panel. A new dashboard will be created, and the dashboard configuration dialog box will appear.



2. Select Show Plot on the left side of the screen.
3. Select Add in the Plot Options dialog box. A list of elements will appear. Select the element to plot and select OK. A new plot will appear.
4. Select the drop-down arrow and then select the Reporting Units for the element to plot.
5. Select the drop-down arrow and then select the Plot Pattern.
6. Select Plot Color and then select the desired plot color.
7. Select Y-Axis to select the Y-Axis to display. Selections: None, Left, or Both.
8. Select OK to save the dashboard configuration.

Showing element Values in the Dashboard

1. From the View menu, select New Dashboard Panel. A new dashboard will be created and the dashboard configuration dialog box will appear.



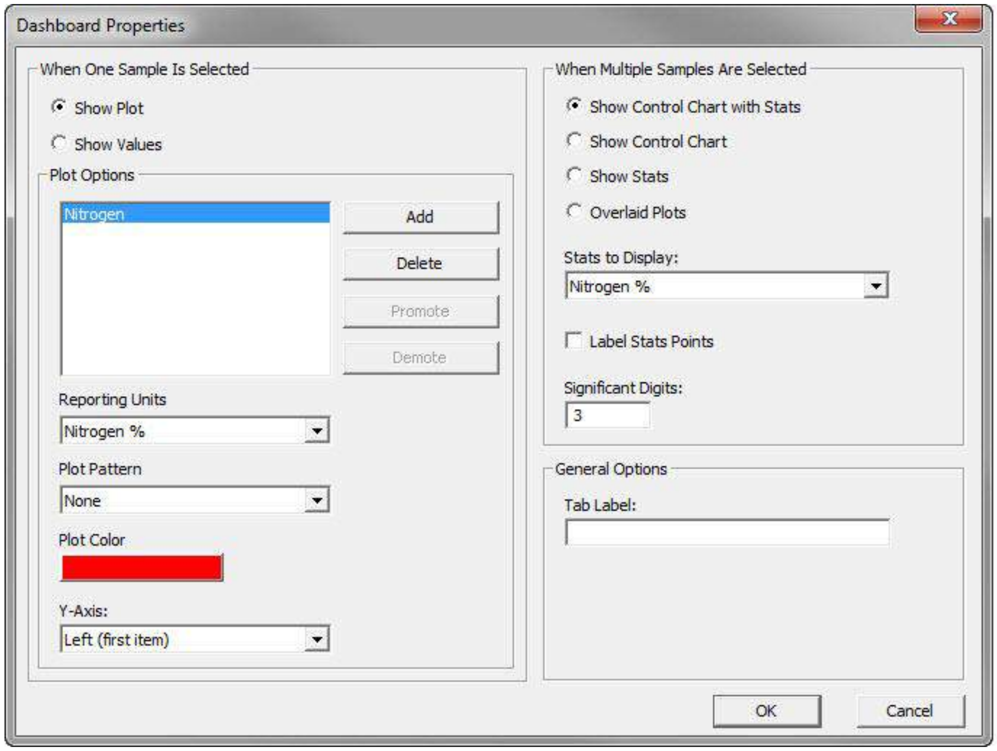
2. Select Show Values on the left side of the screen.
3. Select OK to save the dashboard configuration.

Dashboard Tab Label

Select inside the Tab Label edit box and enter a name that will appear in the tab for the created dashboard.

Multiple Samples Selected

1. From the View menu, select New Dashboard Panel. A new dashboard will be created, and the dashboard configuration dialog box will appear.



2. Use the dialog box on the right to select the information shown in the dashboard. Selections are:

   Control Chart with Statistics—A chart with plotted sample values in addition to the average value, standard deviation, relative standard deviation, and the number of samples selected.

   Control Chart—A chart with plotted sample values.

   Statistics—The average value, standard deviation, relative standard deviation, and the number of samples selected.

   Overlaid Plots—Plots of each selected sample in the same dashboard.

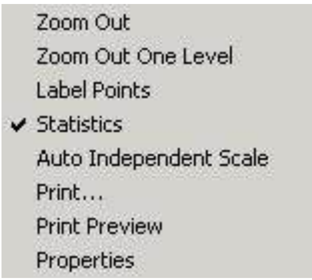
3. Select the drop-down arrow in the Stats to Display selection box and select the desired statistics shown in the dashboard.

4. Select the Label Stats Points checkbox to label the sample points on the chart. The numbers that appear with the point are the sample numbers selected.

5. Select inside the Significant Digits selection box to select the statistics number format.

Configuring the Dashboard

To configure the dashboard, right-click on the dashboard to display the configuration menu.



Zoom Out—Position the mouse cursor over the area of a plot to zoom in. Hold down the left mouse button and draw a box. The area inside the box will be magnified. Draw another box to zoom in further.

Zoom Out One Level—Select Zoom Out One Level to reduce the magnification by one level. Select Zoom Out to zoom out all levels and return to the original plot.

Label Points—Label points will place the sample number near the point on a control chart. Select multiple samples. Right-click the desired dashboard and select Label Points.

Statistics—Statistics will display a control chart or multiple plots. Select multiple samples. Select statistics to display a control chart. Deselect statistics to display multiple plots.

Auto Independent Scale—When multiple selected plots are scaled differently, Auto Independent Scale rescales the plots so they can be compared together. Select Auto Independent Scale to rescale plots.

Properties—Displays the Dashboard Properties dialog box for advanced configuration or creation of a new dashboard. Refer to Creating a Dashboard Panel, page 4–26.

Positioning a Dashboard

Move the mouse pointer over the dashboard tab and hold the left mouse button down. Move the mouse to position the dashboard on the main screen.

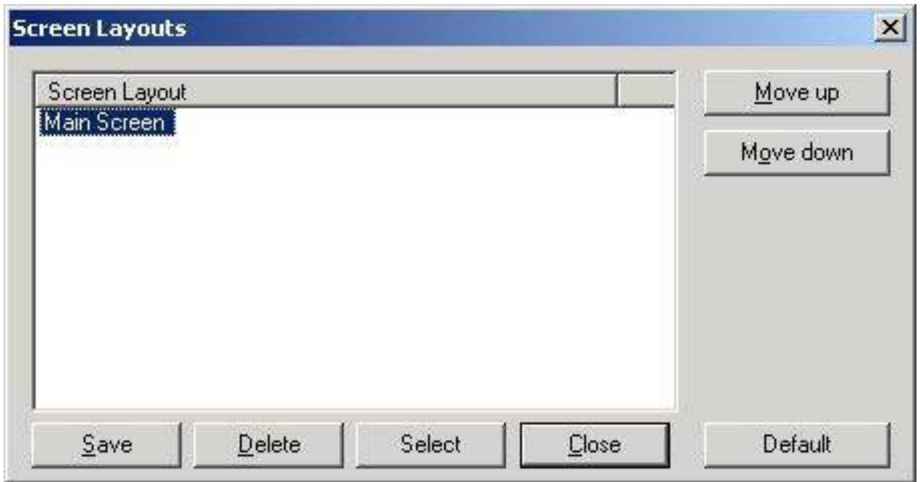
To size the dashboard, move the mouse over the splitter bars and hold the left mouse button down. Move the mouse to move the splitter bars.

Refer to Main Screen Overview, page 4–23.

Screen Layouts

After the Sample Grid and Dashboard are configured, they can be saved as a layout. By saving the layout, you are always assured that you can restore the configuration if it is lost.

1. Configure the main screen as desired. Refer to Display Configuration, page 4–23.
2. Select the View menu and select Screen Layouts. The Screen Layouts Screen will appear.



3. Select Save and enter a unique name for the current screen layout.
4. Select Close to exit and save the screen layout.

Move—Select a screen layout and select Move Up or Move Down to move a selected screen layout up or down the list.

Delete—Select a screen layout and select Delete to remove a screen layout from the list. After a screen layout has been removed, it cannot be restored.

Select—Permits the operator to select a new screen layout. Highlight the desired screen layout and choose Select. Select Close to exit.

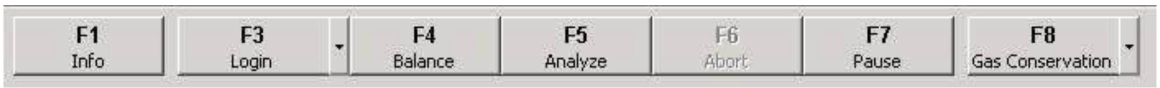
Close—Select Close to exit screen layouts.

Default—Select Default to return to the factory default screen. Select Close to exit.

Hide/Show the Toolbar

If desired, the toolbar can be turned Off or turned back On. The toolbar, located at the top of the screen, is a quick way to perform menu functions without accessing the menus.

From the View menu, select Toolbar. A check indicates the toolbar will be displayed.



Hide/Show the Status Bar

If desired, the status bar can be turned Off or turned back On. The status bar, located at the bottom of the screen, will show operational functions of the instrument as they are currently in progress.

From the View menu, select Status Bar. A check indicates the status bar will be displayed.

Log Bar

The log bar, located at the bottom of the screen, displays information saved in the log file. It only appears when it displays information. This information may be communication failures, severe errors, or operational procedures.

If Log Bar is not checked, it will only display communications failures and severe errors.

If Log Bar is checked, it will display any information saved in the log file. This includes communications failures, severe errors, and operational procedures.

Examples of operational procedures are sample data changes, calibration changes, change to the sample mass, and more.

Shortcuts to Move Between Samples

Go to First Row in the Spreadsheet

The first row in the spreadsheet can be quickly selected.

1. From the View menu, select First Row.
2. The cursor will automatically jump to the first row.

Go to Last Row in the Spreadsheet

The last row in the spreadsheet can be quickly selected.

1. From the View menu, select Last Row.
2. The cursor will automatically jump to the last row.

Go to Analyze Row in the Spreadsheet

The analyze row is the row in the spreadsheet that contains the next sample to be analyzed. This row can be quickly selected.

1. From the View menu, select Analyze Row.
2. The cursor will automatically jump to the analyze row.

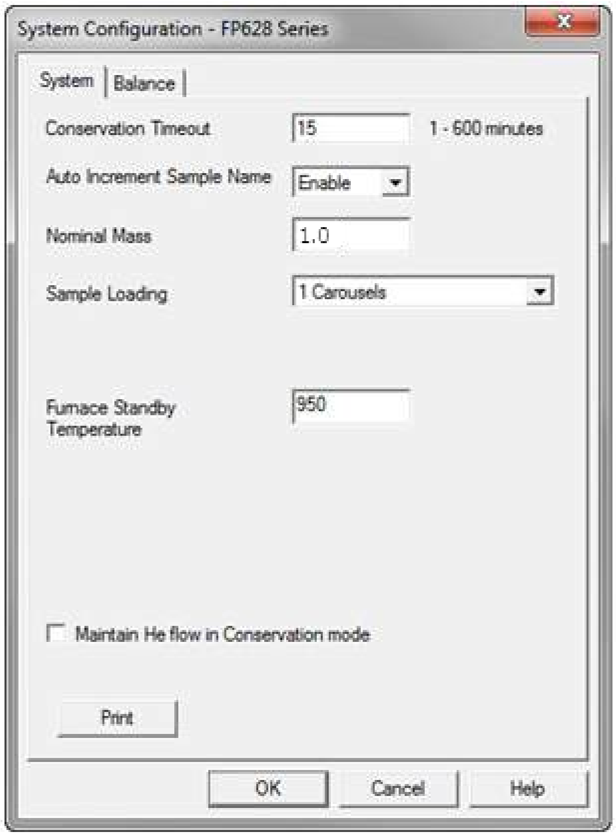
Auto Widths

1. Select the Configuration menu
2. Select Auto Widths to adjust the size of each cell in the sample display to fit the text inside the cell.

System Configuration

System configuration permits the operator to set the overall instrument operating settings and parameter values for a desired application.

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



2. Set the system parameters using the default values as a general guideline. Special settings for certain applications may be entered at this point.
3. After entering all information, select OK.

System Configuration Definitions

Gas Conservation Timeout—The time in minutes, after analysis, when the instrument automatically switches to the gas conservation mode. Range: 1 to 600. Default: 15 minutes.

Auto Increment Sample Name—When enabled, if the file name ends with a number, it will be incremented every time a new sample is logged in.

Nominal Mass—The mass value that will automatically appear during login. Typically, the blank mass value is 1.0 gram.

Sample Loading—Permit the operator to select how samples are loaded into the determinator. The following selections are available:

- **Manual—**Manual should be selected if samples are going to be manually dropped into the loading head. When manual is selected, the autoloader (carousel) or liquid injector is not used.

- **Carousels—**Carousels should be selected if the autoloader (carousel) is used. Select the number of carousels in use. Selections: 1 through 4.

NOTE The Liquid Autosampler Kit selections will only appear if the liquid autosampler was purchased and installed.

- **Liquid Autosampler—**Liquid Autosampler should be selected if the liquid autosampler is used. The liquid loading head should be installed on the determinator.

Liquid Autosampler Port—Selects the communications port that the liquid autosampler is connected to. It is not necessary to configure this port. The software automatically configures it when the port is selected.

NOTE When selecting a communications port for the liquid autosampler, do not select a same port that was selected for the balance and transmit data.

Furnace Standby Temperature—Selects the combustion furnace temperature during gas conservation. Range: 650 to 950°C. Reducing the furnace temperature during standby will increase the life of the combustion furnace and associated components.

Balance Configuration

Balance Configuration permits the operator to select the desired balance parameter values to properly accept the balance's data. Refer to Software Configuration, page 3–8.

NOTE The instrument will only support Sartorius® four- or five-place analytical balances. Other balances may be used; however, LECO is not responsible for installation or proper operation.

For more information on Balance Configuration Definitions, refer to the Glossary, page 12–1.

Test Commands

Send—Used to test the balance interface. Select Send to send a weight from the balance to the system and display the weight in the spreadsheet.

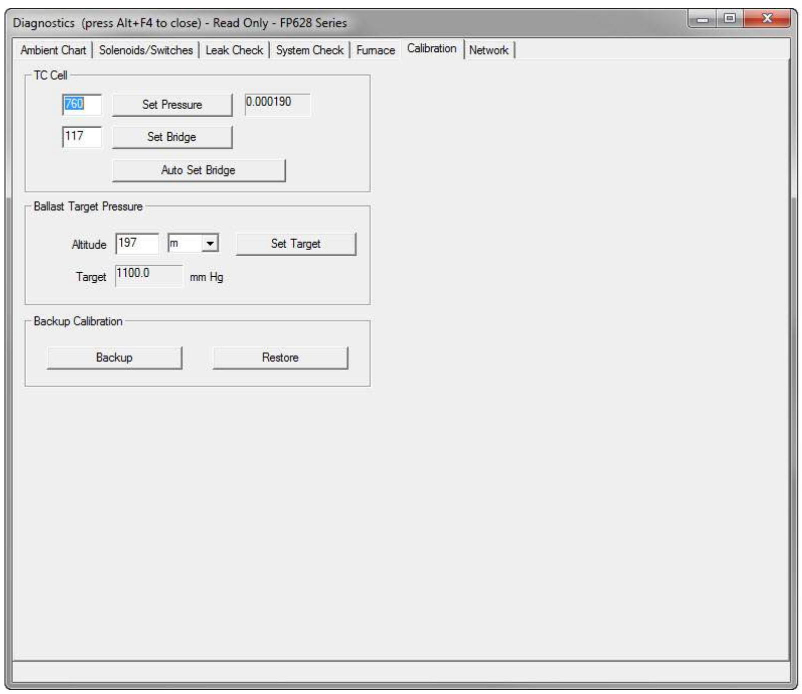
Tare—Used to test the balance interface. Select Tare to set the weight displayed on the balance to zero.

Calibrating Barometric Pressure for TC Cell

Barometric Calibration sets the instrument's barometer to the current barometric pressure. An accurate local barometric pressure value must be available to perform this procedure. Refer to Barometric Pressure, page 7–9, for additional information.

Changes in barometric pressure will affect gas volume. For this reason, the correct barometric pressure must be manually entered to obtain the most accurate results.

1. From the Diagnostic menu, select Calibration. The Hardware Calibration dialog box will appear.



2. Enter the current barometric pressure in the edit box to the left of Set Pressure in the TC Cell box.

NOTE Use values in mm Hg for barometric pressure.

3. Select Set Pressure to set the pressure entered in the edit box.
4. Close the Hardware Calibration dialog box to exit this procedure and save the setting.

Setting Altitude for Ballast Target Pressure

Ballast Target Pressure corrects the target pressure (in mm Hg) for the current elevation.

1. Determine the altitude at the location of the instrument. This can be done via the Internet.
2. From the Diagnostic menu, select Calibration. The Hardware Calibration screen will appear.
3. Enter the altitude in the edit box to the right of Altitude in the Ballast Target Pressure box. Use the drop-down menu to select meters (m) or feet (ft).
4. Select Set Target to set the altitude entered in the edit box. The software will set the Target automatically, if necessary.
5. If the target pressure changes, a dialog box appears, recommending that the method(s) be recalibrated. Refer to Creating and Modifying a Method, page 4–48.
6. Select Close to exit this procedure and save the setting.

Remote Communication

Remote communication includes the remote sample login option, the remote control option, and data transmit. These software options are found on select LECO products used to enable their incorporation in an automated environment. They can be used to control the instrument from a remote location via a RS232 or Network interface and/or to receive data from the instrument.

Remote sample login allows a remote computer to log in unanalyzed samples while the local computer retains control. Remote control allows a remote computer to control the instrument by taking over the local computer so that only commands from the remote computer are sent to the instrument. Data transmit allows sample data to be transmitted to a remote computer. For further information and instructions, refer to Remote Sample Login, Remote Control, Data Transmit, and Analysis Results, beginning on page 4–39.

Data transmit needs at least uni-directional communication from the local computer to the remote computer.

Remote sample login and remote control communicate with the local computer via a bi-directional communication protocol using XML commands. The remote computer exchanges commands and data with a remote computer via a serial port or network connection. The serial port is configurable with respect to the port, baud rate, parity, etc. The network connection is a TCP/IP stream with a configurable port.

The remote computer sends commands to the local computer, and the local computer acknowledges the commands or returns the requested data. Return data will be in XML format; however, sample results are returned in the format specified by the current data transmit format on the local computer. If no data transmit format is defined on the local computer, the software will return the sample information in XML format for the data fields currently specified in the sample grid. For a list of commands that can be sent to the local computer and what will be returned to the remote computer, refer to XML Command Table, page 4–42.

The text of the commands and data can be in ASCII or Unicode and are formatted in XML. The XML format is a way of tagging the commands and data fields inside of angle brackets (less-than and greater-than signs). The use of spaces, tabs, carriage returns, and line feeds are optional.

Remote control and remote sample login are primarily used with automation systems, which load and analyze samples without operator input. Refer to Automation, page 5–66.

Remote Sample Login

Remote Sample Login Mode allows a remote user on a remote computer to log in samples to be analyzed and to check the overall status of the instrument. The local user running the instrument retains control of the instrument and can add the remote login samples for analysis when convenient.

With remote sample login, the local computer will store sample data in temporary memory as the sample data arrives from the remote computer until the F3 button on the Toolbar is selected. After selecting F3, the sample data will be entered into the spreadsheet.

To enable the remote sample login mode from the Remote Communication on the System Configuration menu, refer to step 8, page 4–41.

Remote Control

The remote control mode allows a remote user on a remote computer to log in samples to be analyzed, to check the overall status of the instrument, to start an analysis, and to control the instrument. In remote control mode, the local user must relinquish control of the instrument; the software does not allow the operator to interact with the software. Instead, it relies completely on a remote computer to log in samples and initiate the analysis. The remote control mode is active only when the remote control monitor is displayed.

To enable the remote control mode, select Start Remote on the Configuration menu, or, once the system has been configured for remote communication, select the Enable Remote Control on Startup checkbox from the Remote Communication tab on the System Configuration menu. Refer to step 8, page 4–41.

Data Transmit

Data transmit mode allows sample data to be sent to a remote computer by transmitting sample results in a pre-defined (but configurable) format to a remote computer. The transmission occurs upon operator selection of a menu command and, as an option, automatically at the completion of each analysis. Refer to 9, page 4–42.

NOTE The software does not require or accept any commands or data from the remote computer.

To enable data transmit, create a transmission format and, if available, select to place a √ 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 and 9, page 4–41. 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

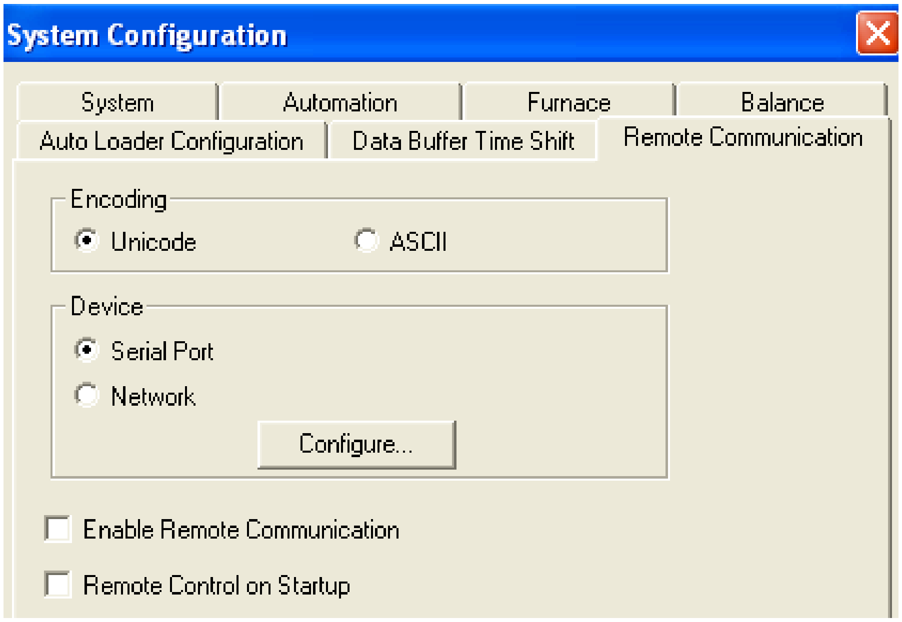
```
<DelResults>

  <Days>100</Days>

</DelResults>
```

Configuring 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**
<AddSample> <Name>*sample name*</Name> <Mass>*mass*</Mass> <Method>*method*</Method> <Comments>*comments*</Comments> <Description>*description*</Description> </AddSample> RESPONSE <OK></OK>	Adds a new, unanalyzed sample.
<Cancel></Cancel> RESPONSE <OK></OK>	For debugging purposes only. Allows the software developer to cancel a partially entered command when using a remote terminal device.

Remote Sample Login & Remote Control Commands & Return Messages	**Description**
<Counters></Counters> RESPONSE <Counter> <Name>*counter name*</Name> <Count>*counter count*</Count> </Counter> *(repeat)*	Returns each of the counters maintenance values.
<Disconnect></Disconnect> RESPONSE <OK></OK>	Disconnects from the remote computer and waits for a new connection.
<Help></Help> RESPONSE *All commands available*	For debugging purposes only. Allows the software developer to query the list of supported XML commands.
<Login> <User>*user name*</User> <Password>*password*</Password> </Login> RESPONSE <OK></OK>	Logs in a new user.
<Logoff></Logoff> RESPONSE <OK></OK>	Logs off the current user.
<Results> </Results> RESPONSE <Results> *sample results – user configurable* </Results>	Returns the results of the most recently analyzed sample.

Remote Sample Login & Remote Control Commands & Return Messages	**Description**
<Status></Status> RESPONSE <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>	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.
<Version></Version> RESPONSE <Version> <Commands>*XML parser version*</Commands> <Program>*software version*</Program> </Version>	Sends the XML parser version and the software version.

Messages

Remote Control Return Messages	Description
RESPONSE <InstrumentError> <Action>*action that was being taken*</Action> <ObjectType>*type of object for error*</ObjectType> <ObjectName>*name*</ObjectName> <Details>*details of the error*</Details> <User>*name of the operator*</User> <DateTime>*date and time of error*</DateTime> </InstrumentError>	Instrument had an error and is passing on the details to the listener.
RESPONSE <SampleDetected> <Name>*name of the sample*</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>

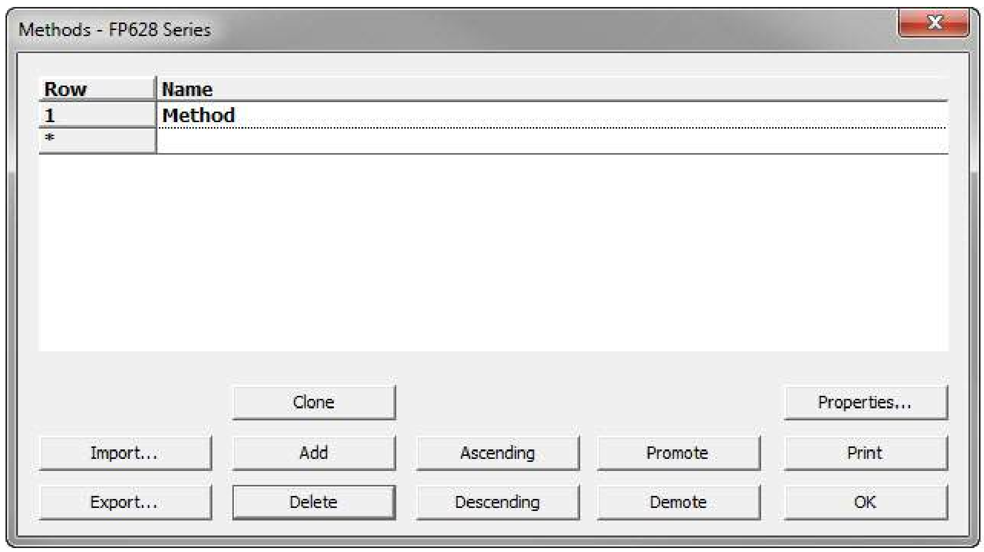
</Analyze>

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.

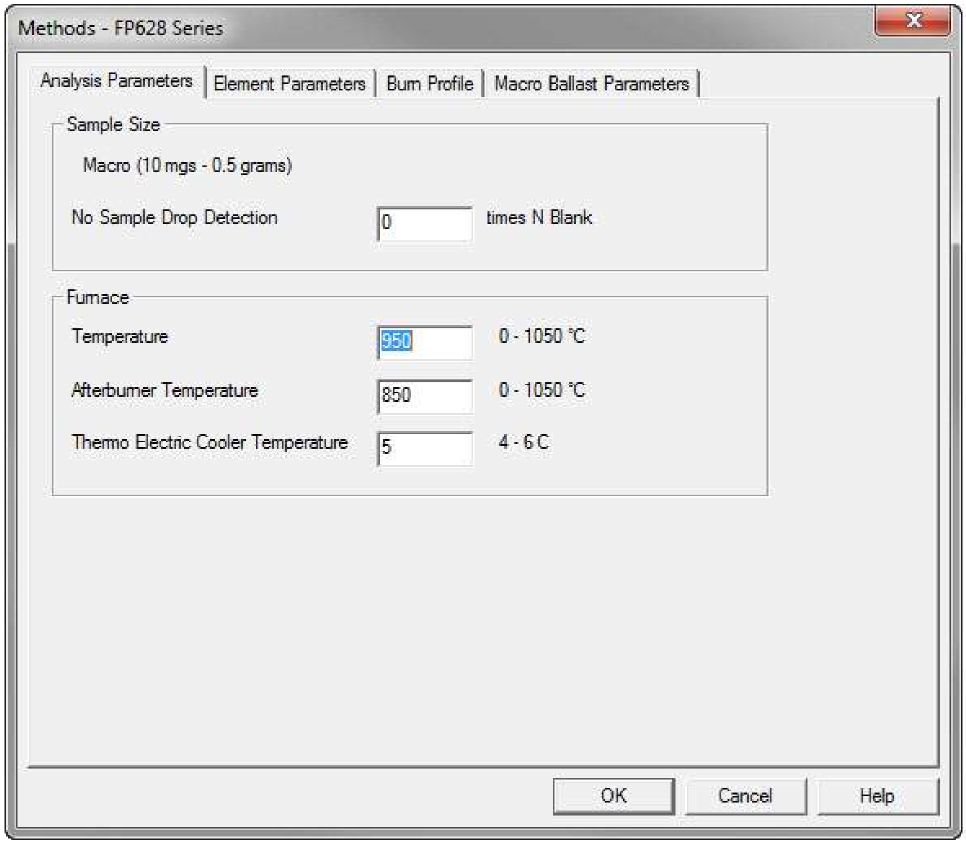
Creating a Method

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

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



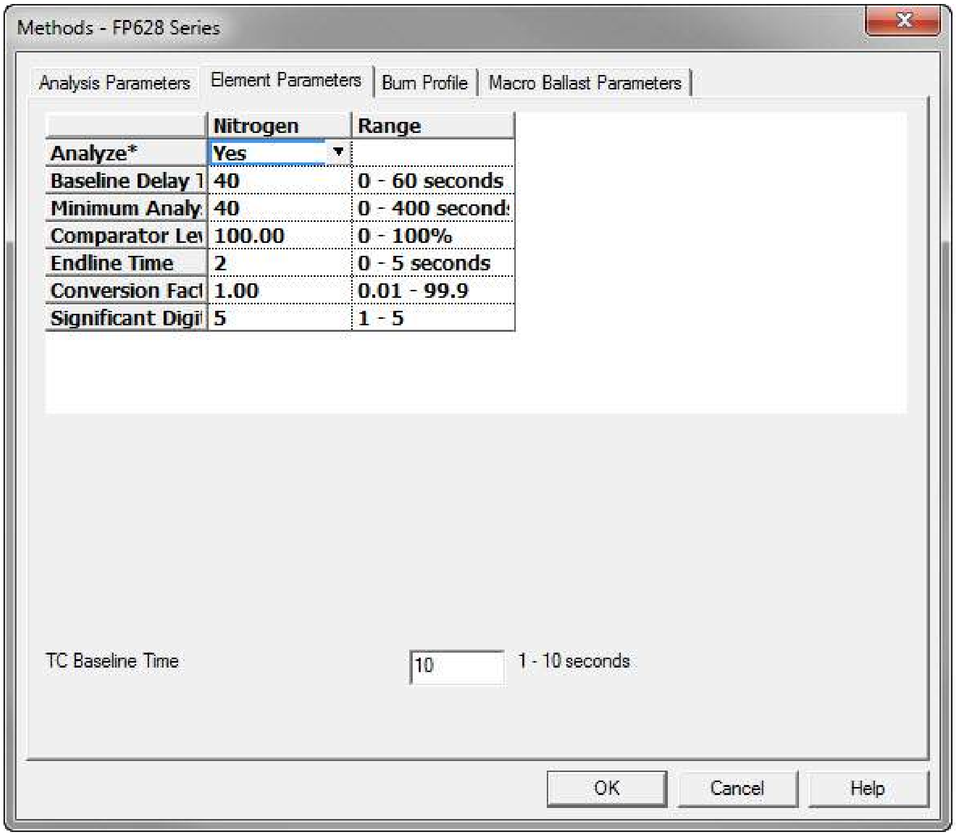
A. Enter the desired analysis property values.

B. Select OK when finished.

NOTE Although most official methods state 850°C as the acceptable temperature for combustion in the primary furnace, LECO recommends 950°C to achieve the highest level of sample oxidation.

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

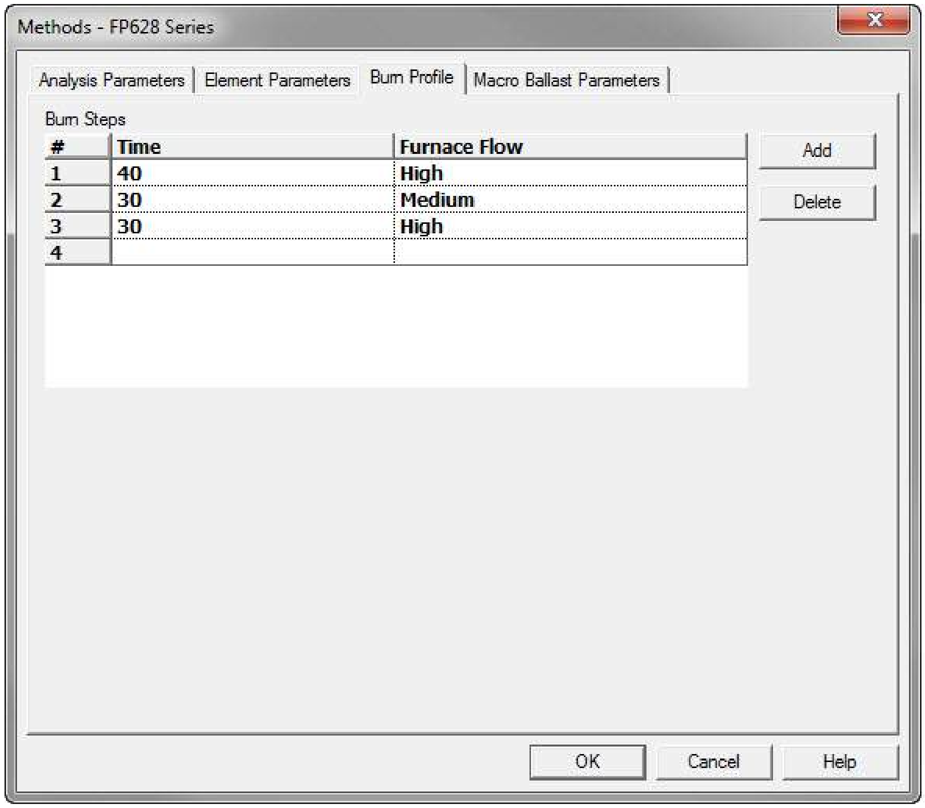
The recommended minimum analysis time for nitrogen for the argon model is 60 seconds. The default 40 seconds, as shown in the following screen shot, is for the helium model.



D. 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.



The purpose of the burn profile is to achieve complete combustion, before filling the ballast volume, in the least amount of time with the most efficient use of oxygen. Rapidly combustible materials, such as sucrose, grains, and oils, require a high initial flow to prevent incomplete combustion. Materials that burn slower require a medium initial flow until reaching combustion temperature.

To avoid incomplete combustion of the sample, it is recommended to start with a high flow then decrease to medium flow. Low or erratic answers or, in extreme cases, the presence of soot in the lance or filter tube may indicate incomplete combustion. The burning sample may be observed through the sample drop block during combustion. The tin capsule generally burns intensely after the sample is gone.

To select the flow rate and time period for each flow, refer to Creating a Method, page 4–48.

Figure 4-2, page 4–52, shows a typical burn profile. Flow 1 is set at high for 30 seconds. Flow 2 is set at low for 30 seconds. Flow 3 is set at high until end of analysis.

For Burn Profile definitions, refer to the Glossary, page 12–1.

G. Select OK when finished.

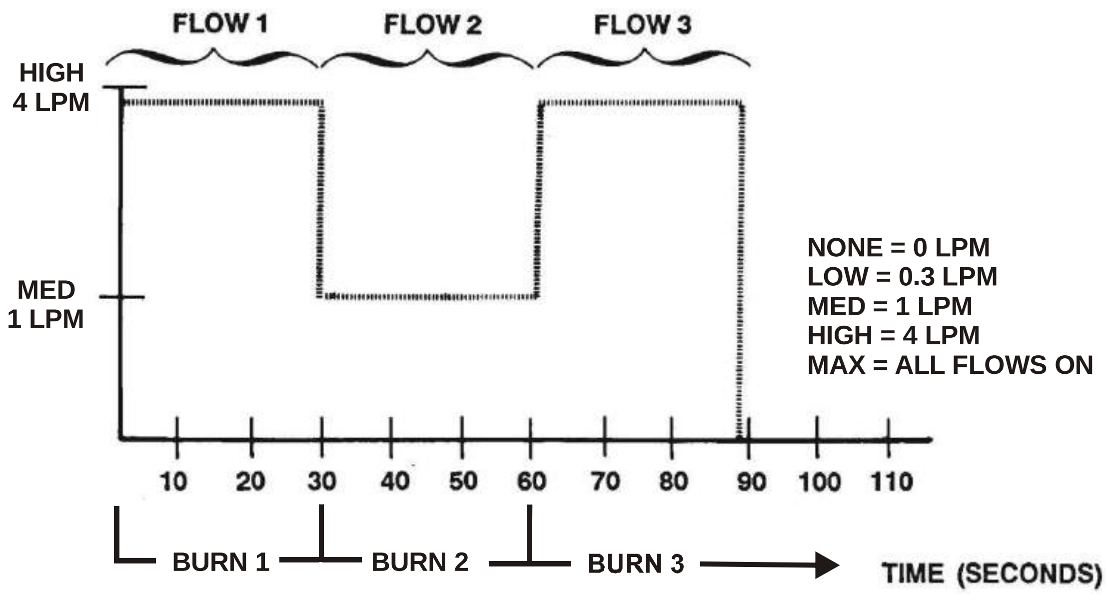
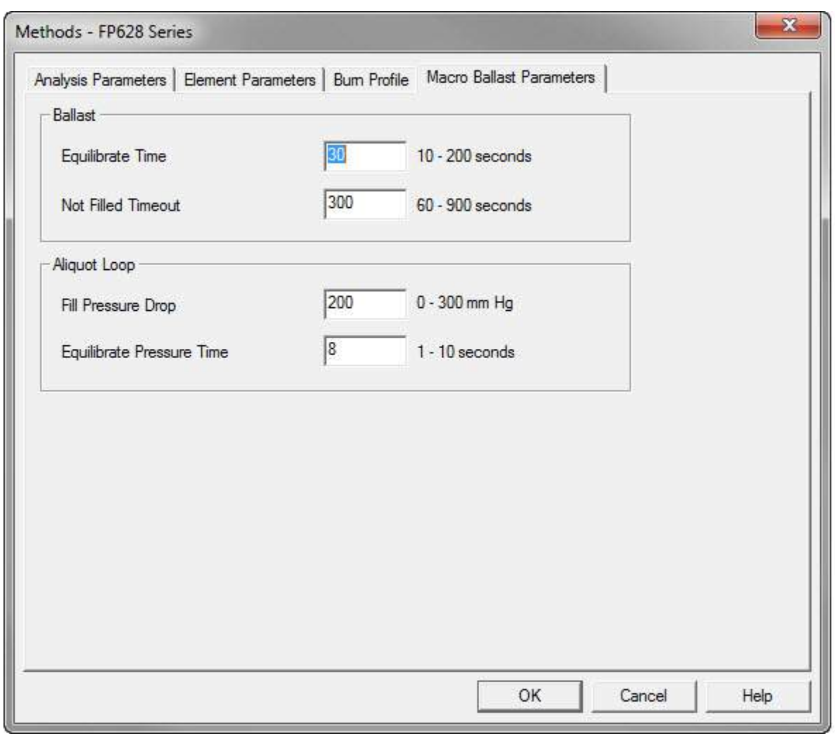


Figure 4-2
Burn Profile

H. Select the Macro Ballast tab to display the ballast properties dialog box. For macro ballast definitions, refer to the Glossary, page 12–1.



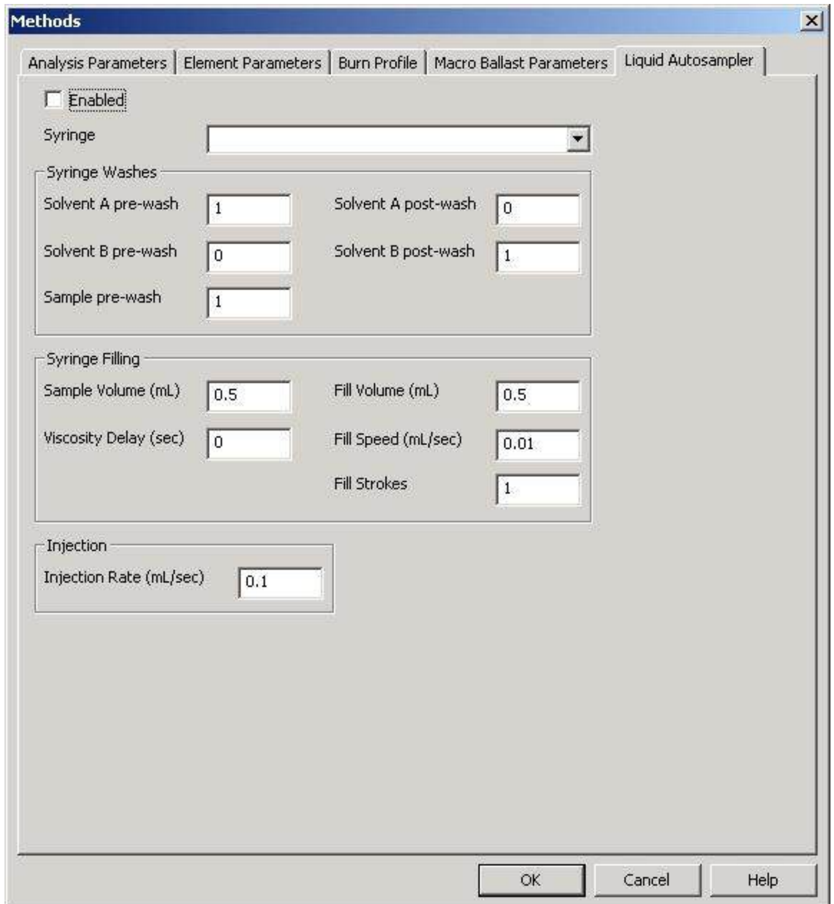
I. For Equilibrate Time, enter the time period for gases in the ballast to mix after it is filled.

J. Enter the desired Macro Ballast property values.

K. Select OK when finished.

NOTE A Liquid Autosampler must be installed on the unit for the liquid autosampler tab to appear.

L. Select the Liquid Autosampler tab to display the liquid autosampler properties dialog box.



M. Check the Enable checkbox to enable the liquid sampler.

N. Enter the desired Liquid Autosampler property values.

O. Select OK when finished.

For Analysis and Element Parameter definitions, refer to the Glossary, page 12–1.

Liquid Autosampler

Syringe—A drop-down menu displays the available syringes; select the desired syringe. A blank cell means that the auto sampler is not On or is not connected.

Solvent A Pre-Wash—Enter the number of times solvent A is drawn into the syringe and expelled into the assigned waste bottle.

Solvent B Pre-Wash—Enter the number of times solvent B is drawn into the syringe and expelled into the assigned waste bottle.

Sample Pre-Wash—Enter the number of times a sample solution is drawn into the syringe and expelled into the assigned waste bottle.

Solvent A Post-Wash—Enter the number of times to rinse the syringe after sample injection. (Minimizes cross contamination with the next sample.)

Solvent B Post-Wash—Enter the number of times to rinse the sample out of the syringe. (Minimizes cross contamination with the next sample.)

Sample Volume (ml)—Enter the sample volume amount in microliters (μL).

Viscosity Delay (sec)—Specify the length of pause allowing viscous samples to be drawn into the syringe.

Fill Volume (ml)—Controls the filling of the syringe. Air bubbles can remain below the plunger after the first pull up. If the plunger is moved up and down several times, the air bubbles are worked out; therefore, the syringe can be completely filled even when using very small sample volumes.

Fill Speed (ml)—Specify the speed of plunger movement (used in all syringe filling operations).

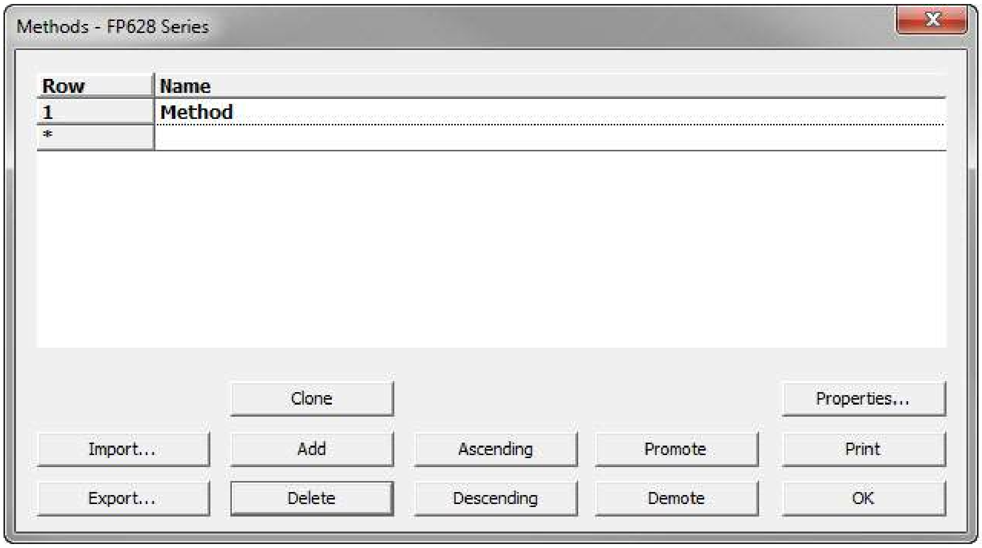
Fill Strokes—All fill strokes, except the last one, use the selected fill volume. If the selected sample volume is higher than the fill volume, the sample volume is used for all fill strokes. If 0 is selected, the plunger is pulled up only once using the sample volume value.

Injection Rate (ml/sec)—Enter the speed the sample is expelled into the injector.

Modifying a Method

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.

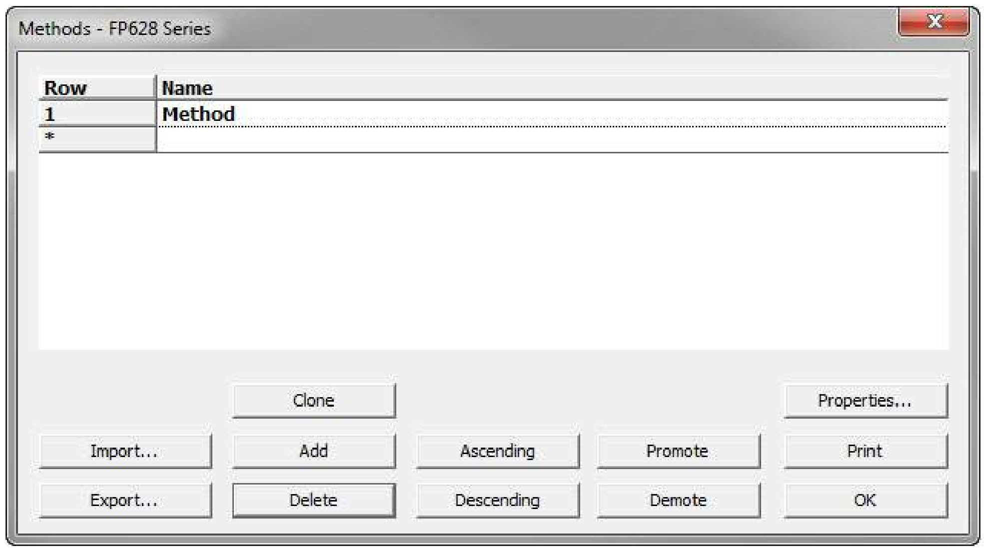


3. Select Properties to change the method properties. Refer to Creating a Method, page 4–48.
4. To move a selected method up toward the top of the list, select it and then select Promote.
5. To move the selected method down toward the bottom of the list, select it and then select Demote.
6. Select Ascending 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

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.

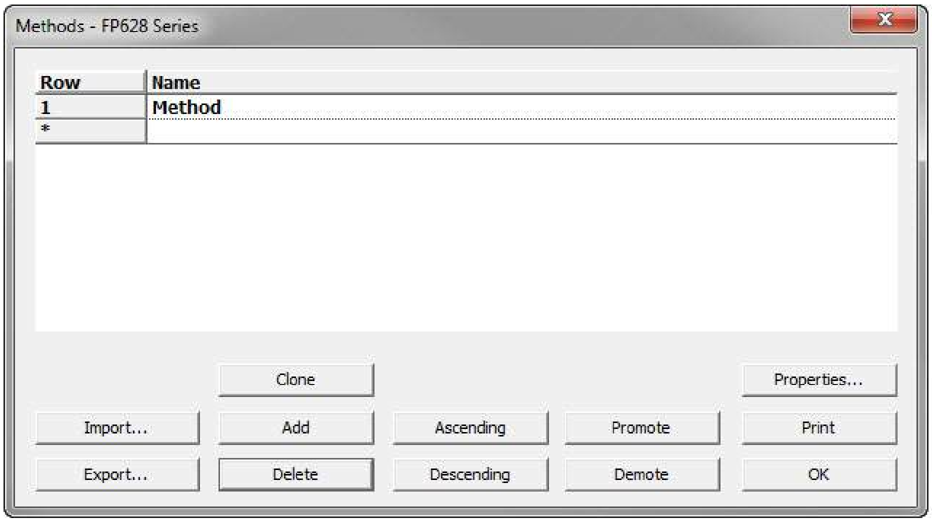


2. Select a method to clone by selecting the method row.
3. Select Clone to add another method to the method list with the same method parameters as the selected method.
4. Select the cloned method name and change it to make it different from the selected method.
5. Select OK to exit and save the cloned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

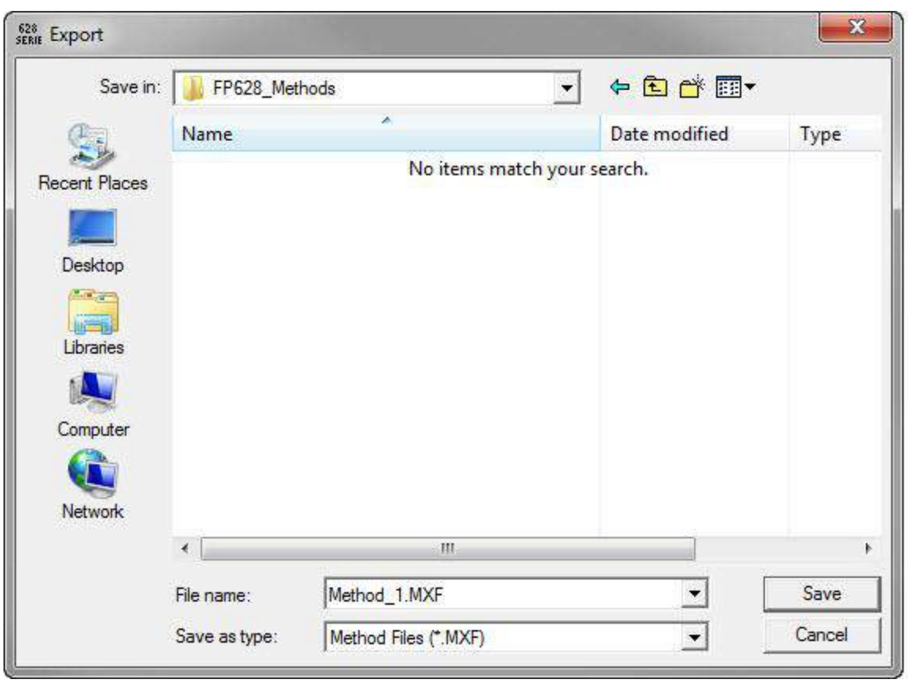
Exporting a Method

Export a Method permits the operator or manager to copy a method to a file. The method can be saved on the system's 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 FP628 instrument. Refer to Importing a Method, page 4–59.

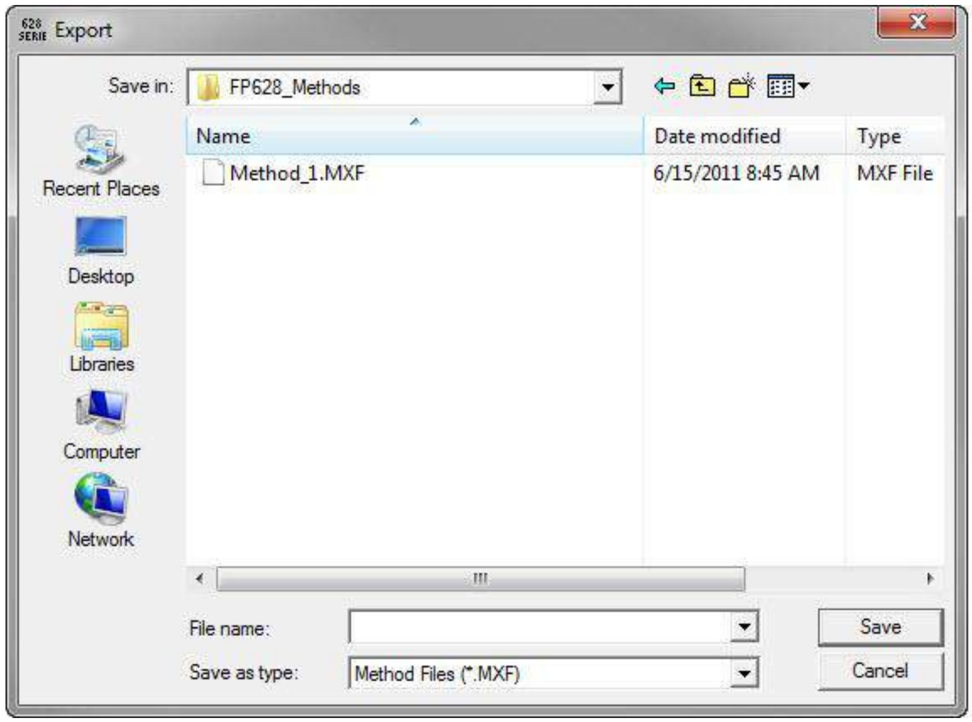
1. Select the Configuration menu and select Method. The Method screen will appear.



2. Select the method to export by selecting 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.

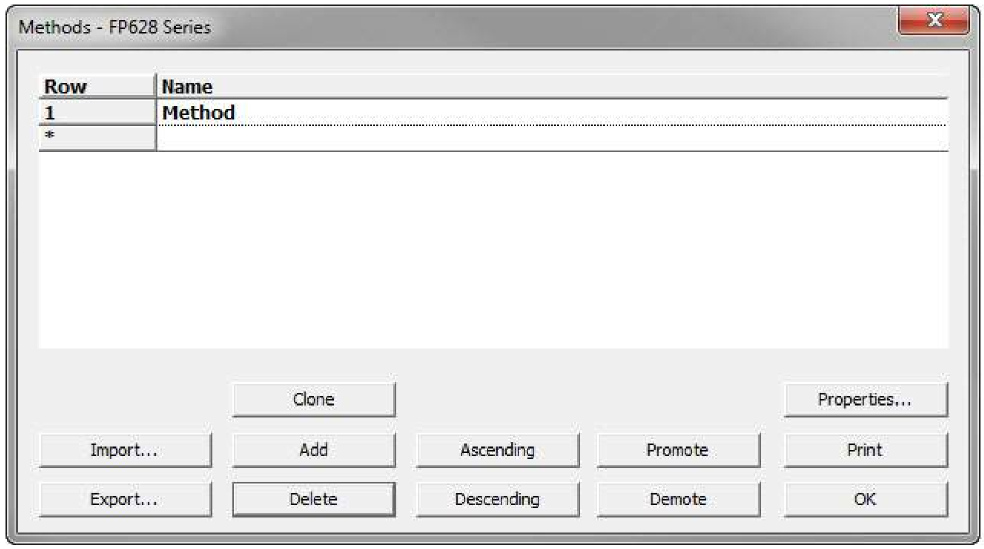


5. Select Save to copy the method to the selected file.

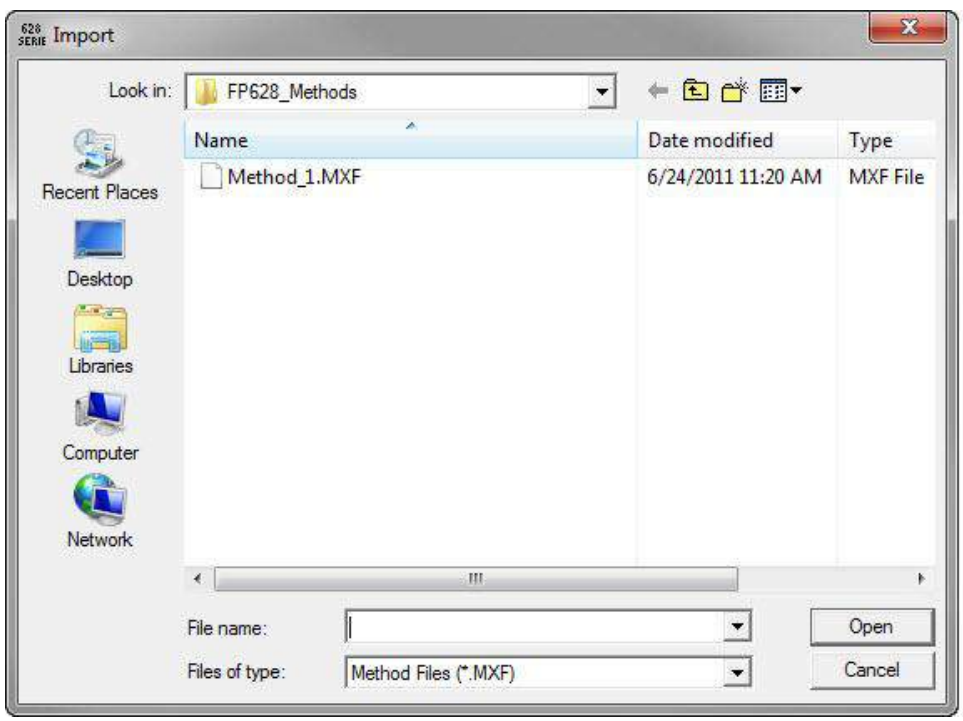
Importing a Method

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 FP628 instrument.

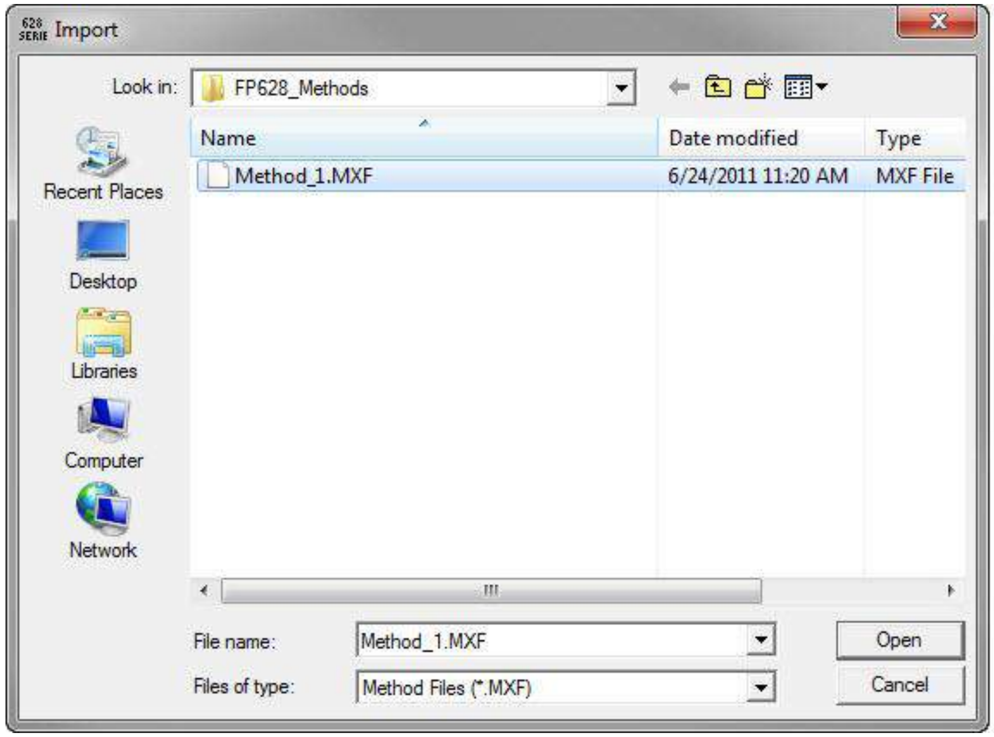
1. Select the Configuration menu and select Method. The Method screen will appear.



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



3. Select the Method File to import.



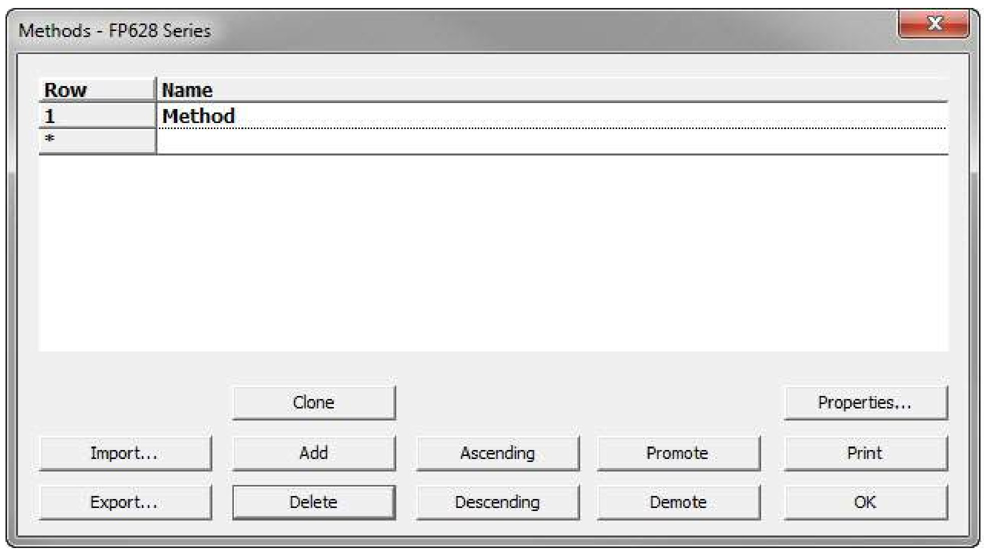
4. Select Open. The method will be added to the analysis method list.

Deleting a Method

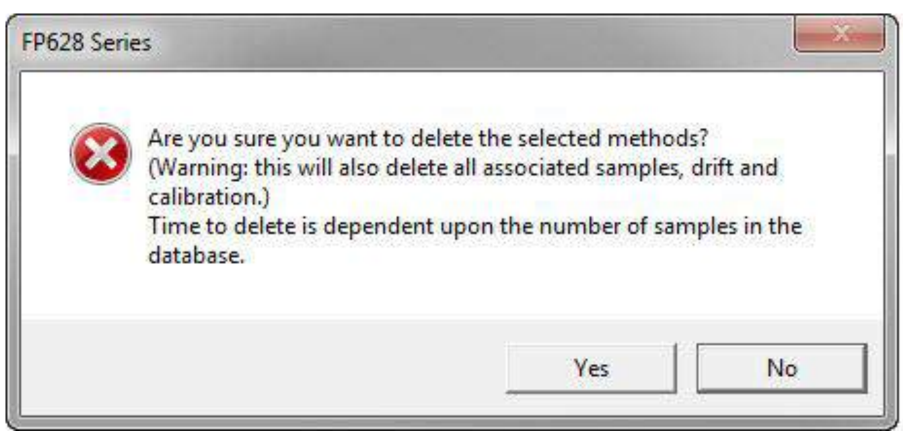
If a method is deleted using this procedure, all samples and calibrations associated with the method are also deleted.

Once a method is deleted, it cannot be restored.

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



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



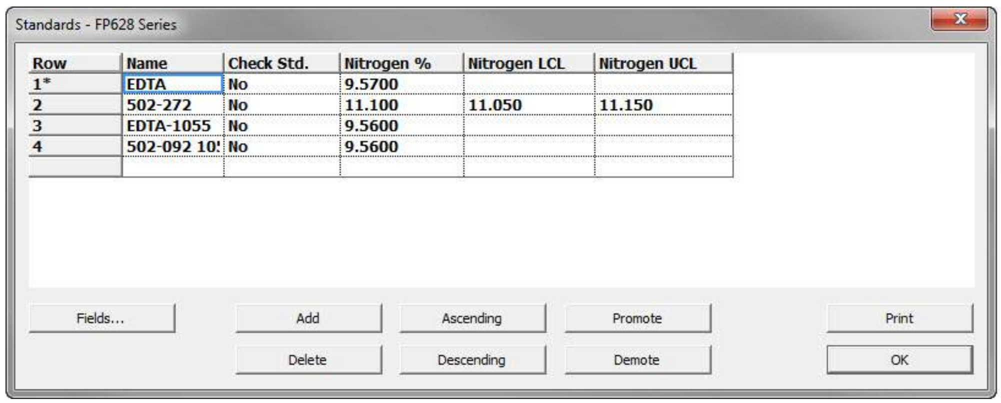
4. Select Yes to delete the selected method.

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 FP628.

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



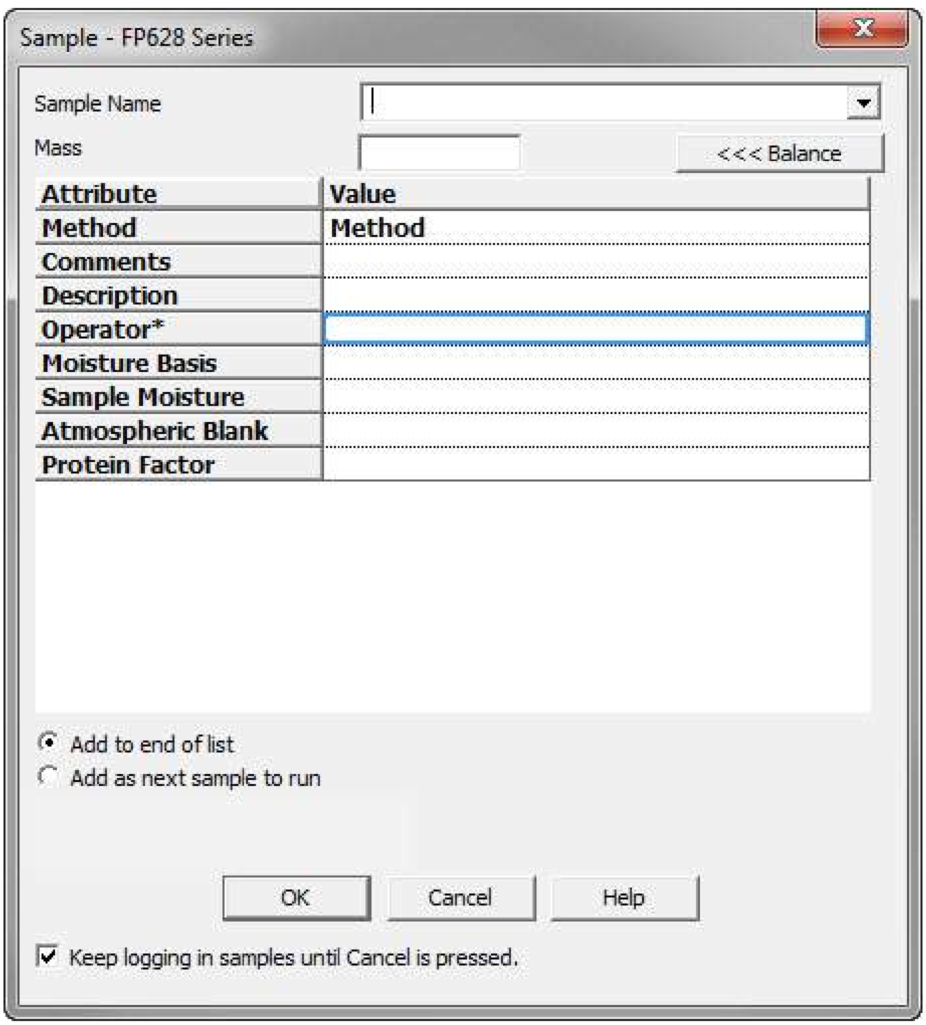
2. Select Fields to edit the displayed fields or columns on the Standards screen.
3. Select Add to list a standard. A row will be added to the bottom of the spreadsheet.
4. Select the row and enter a standard name, value, lower control limit (LCL), and upper control limit (UCL).
   - The lower control 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 the Glossary, page 12–1, for calibration standards definitions.

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



2. Select the drop-down arrow in the sample name selection box and then select a defined standard from the list.
3. Enter the information required in the Login Screen.
4. 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—Check 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.

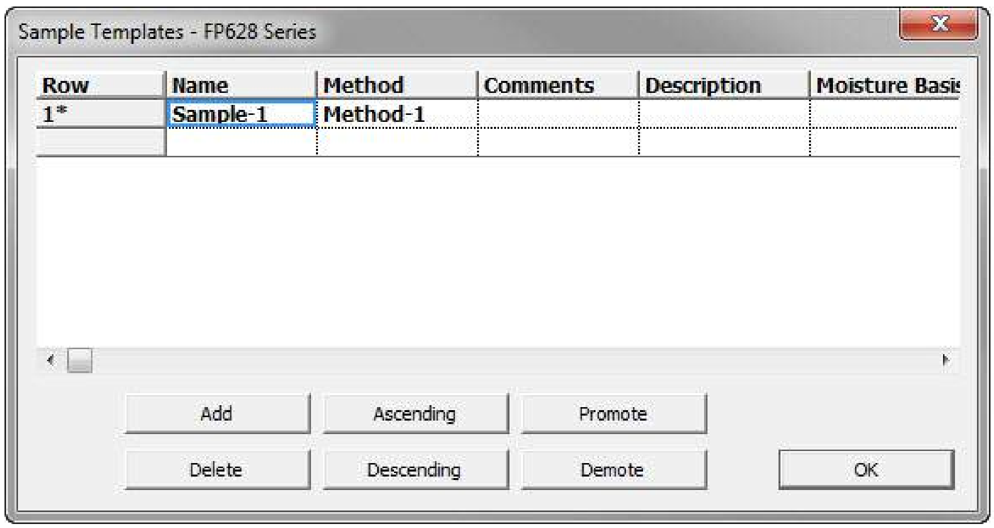
Keep Logging in Samples until Cancel is Pressed—Check this box to log consecutive standards. The dialog box will reappear after OK is selected. This is an optional entry.

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

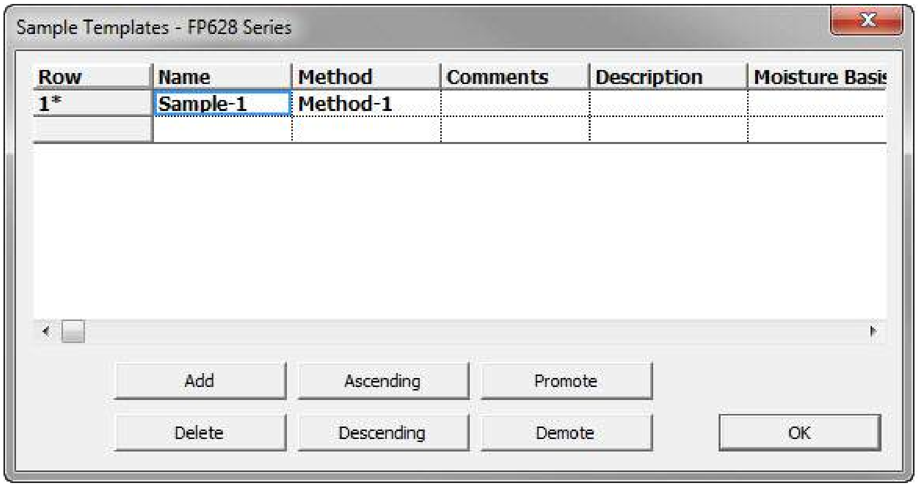
1. An analysis method should be developed before a sample is logged in. Refer to Creating a Method, page 4–48.
2. From the Configuration menu, select Sample Templates. The Sample Templates screen will be displayed.



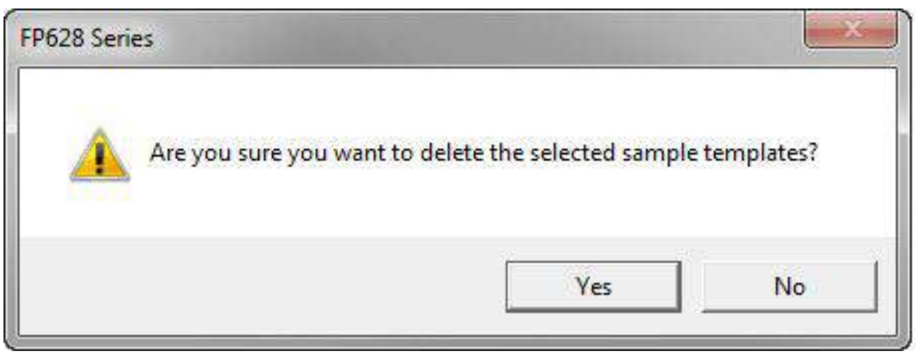
3. Select Add to create a method. A row will be added at the bottom of the list. Enter a method name.
4. To change the name, select the default name by selecting the name and entering a new name.
5. Select the method cell and enter a method.
6. Select the comments cell and enter any comments.
7. Select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



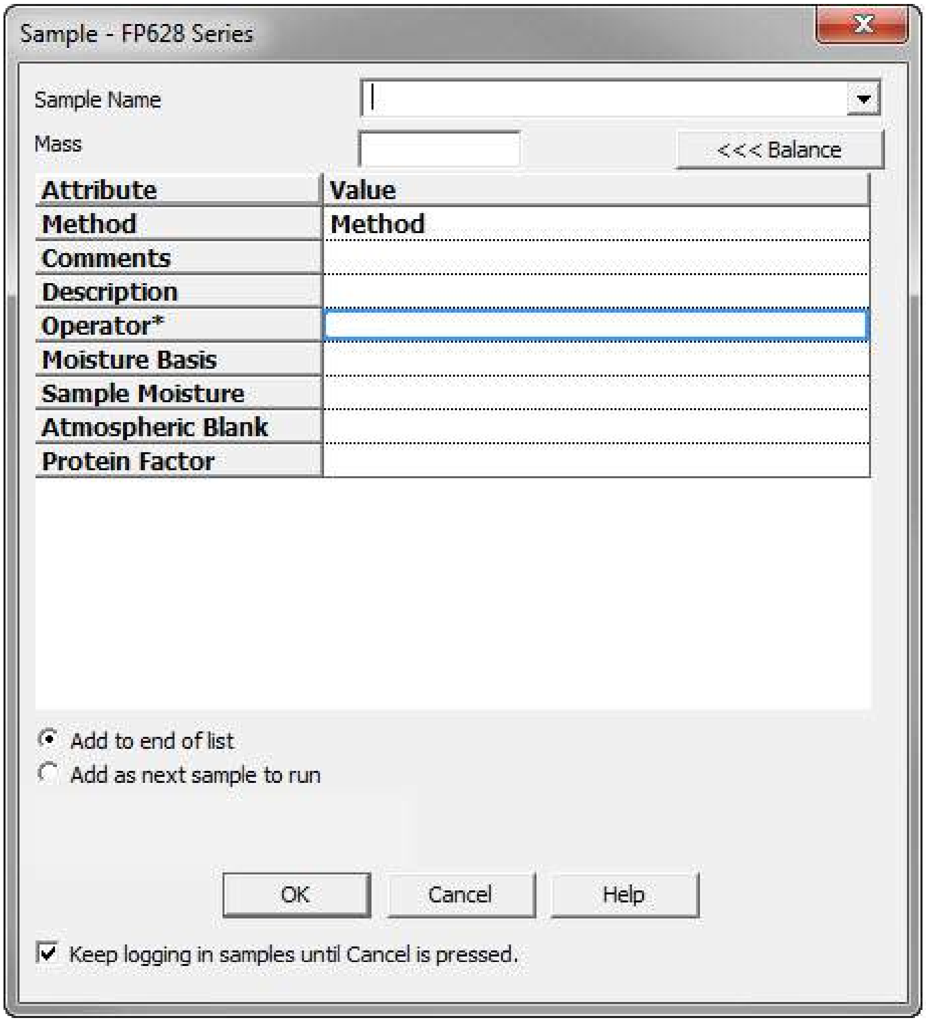
4. Select Yes to delete the sample template or No to exit without deleting the sample template.

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 5–19, 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.

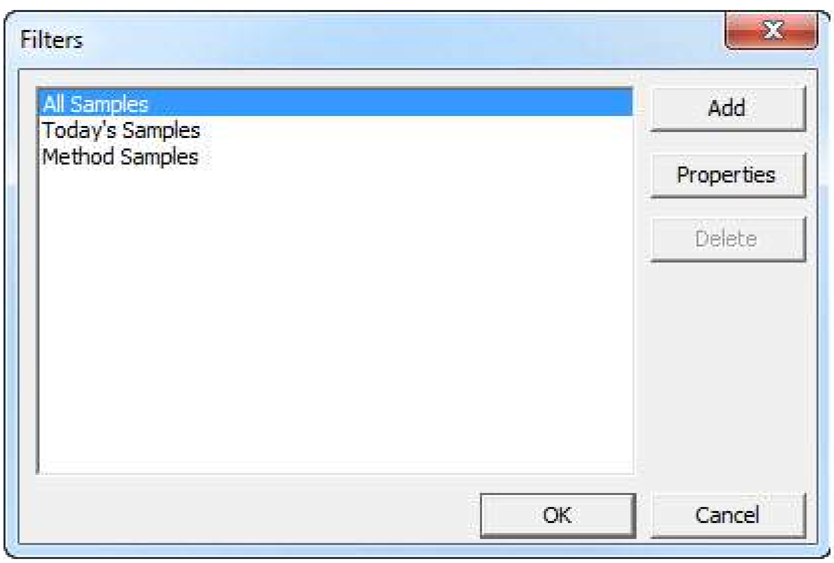
NOTE There are three predefined fields:

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

Applying a Filter and Sort Sample Data

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

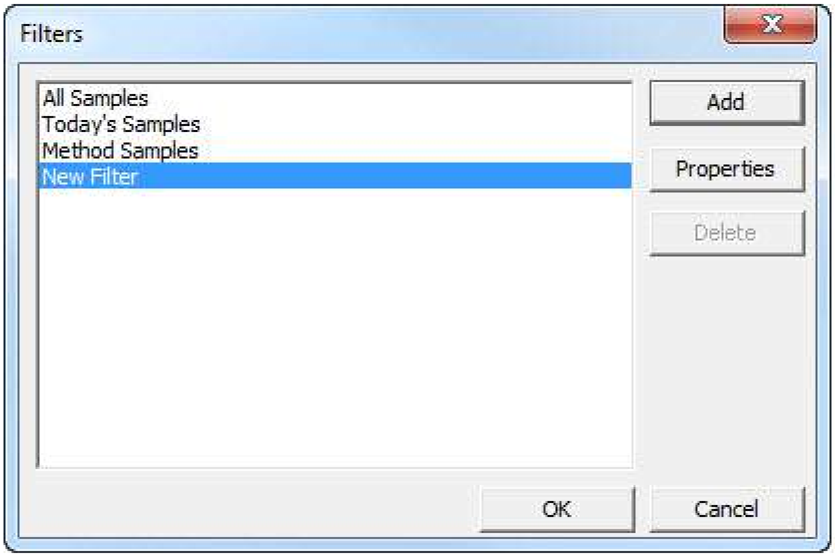
NOTE The filters All Samples and Today's Samples will always appear. In addition, a filter will appear for each defined method.



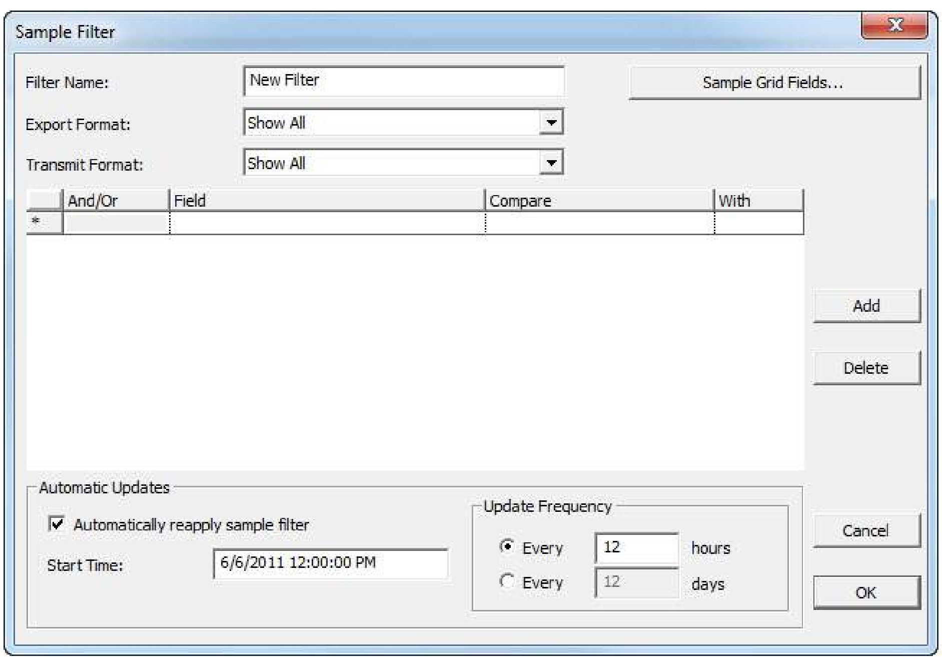
2. Select the desired sample filter and select OK. The dialog box will disappear and the sample grid will reappear with the filter applied.
3. Select Cancel to exit without applying the filter.

Defining a Filter to Apply

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

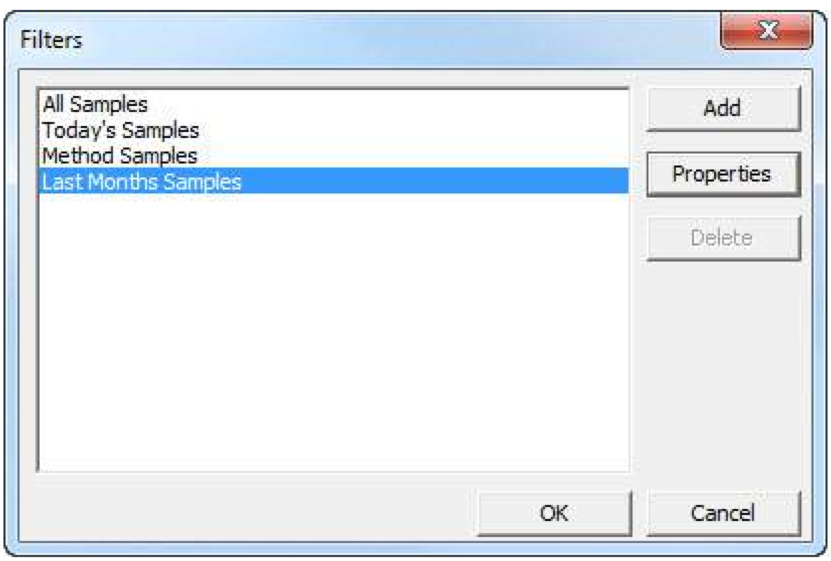
6. Select the cell under Field and enter a sample field to sort. As examples, you can sort on a sample name or method. A drop-down arrow will appear. Select the desired field from the list.
7. Select the cell under With to sort the field name with. As an example, the field name can be sorted with a specific 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 filed 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.

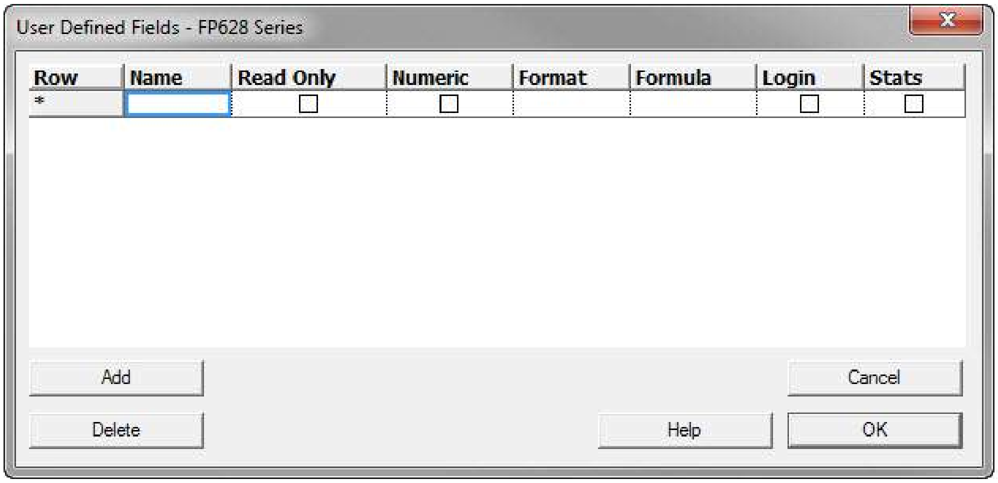


2. Select the filter to automatically apply and select Properties. The Properties dialog box will appear.
3. Check Automatically Reapply Sample Filters.
4. Enter the time, date, and update frequency.

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 4–72.
    - For Formula, enter a formula to use if the field will be used for a calculation. Refer to Formulas, page 4–73.
    - Select the Login checkbox and the field will appear in the Login Sample dialog box. Refer to Sample Login, page 5–19.
    - 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 4–30. 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 that 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
Sn.m	0.123456	S4.5	1.235E-1
	0.000789	S3.5	7.9E-4
	0.000789	S3.2	0.0E-1
	321.8765	S3.5	3.22E+2
En.m	0.123456	E4.5	123.5E-3
	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 x 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 % (not both) is >0.01, 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 4–76.

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.

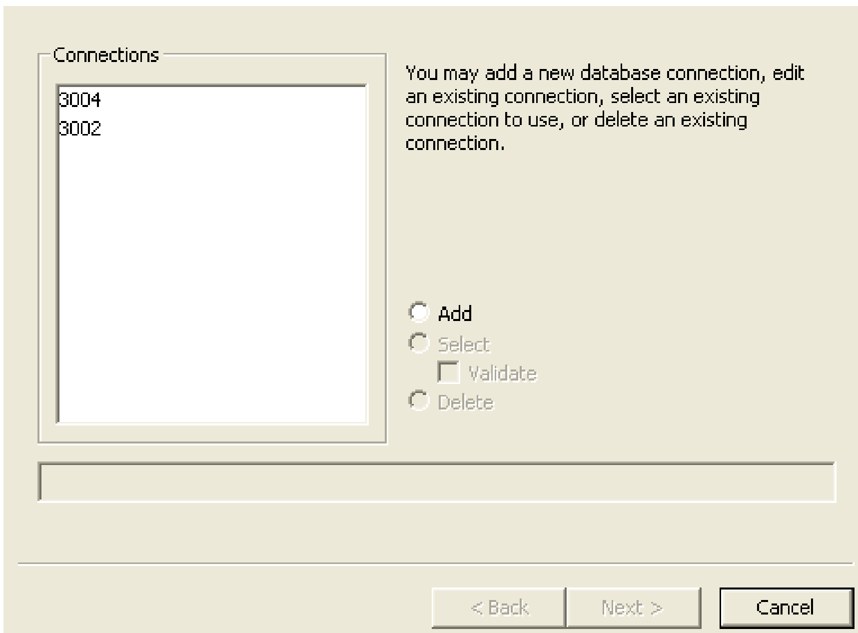
For 21 CFR Part 11 compliance, logging can be enabled when a database connection is created. When logging is enabled, Presentation Time, View History, and Archive Log appear on the Database menu in the instrument software.

This section explains the following topics:

Using the Start Dialog Box

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 4–78.

Or

Select an existing database connection and then make one of the following selections:

- Click Select to connect to a database that already exists. Refer to Selecting a Database Connection, page 4–77.
- 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 4–82.

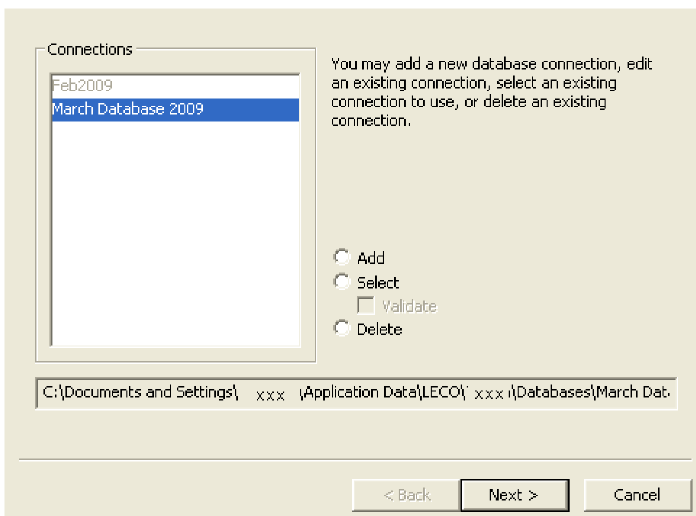
- Select Delete to remove a database connection. Refer to Deleting a Database Connection, page 4–81.
- Compact/Repair is not necessary for file system databases (and does not appear on the Start dialog box); however, it is available for Legacy Databases. Select Compact/Repair to compact an existing Legacy Database to conserve disk space and to repair a possibly corrupted Legacy Database. Refer to Compacting/Repairing a Legacy Database, page 4–84.

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.

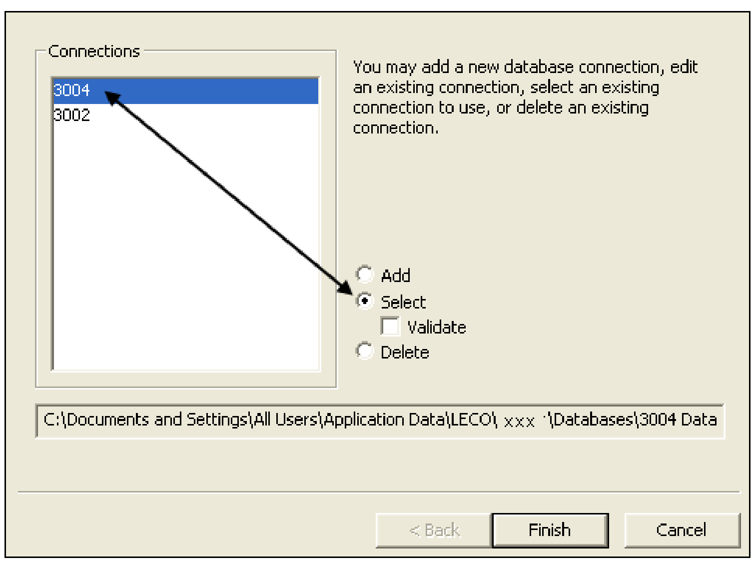
Or

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 4–78.

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. Click 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.

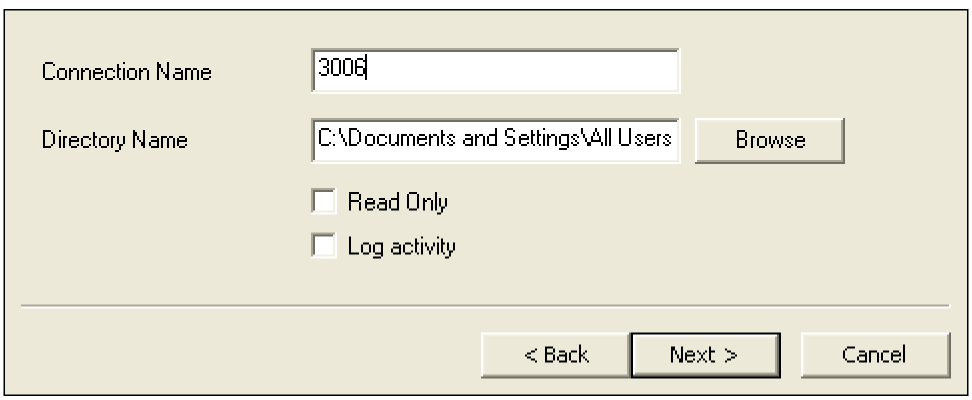
Refer to Adding a Connection to an Existing Database, page 4–78.

Refer to Adding a Connection to a New Database, page 4–79.

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:

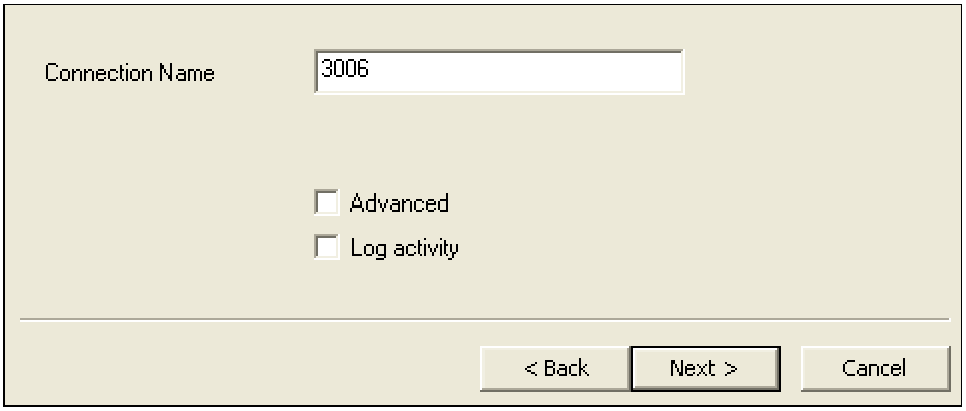
A. Select Add.

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:

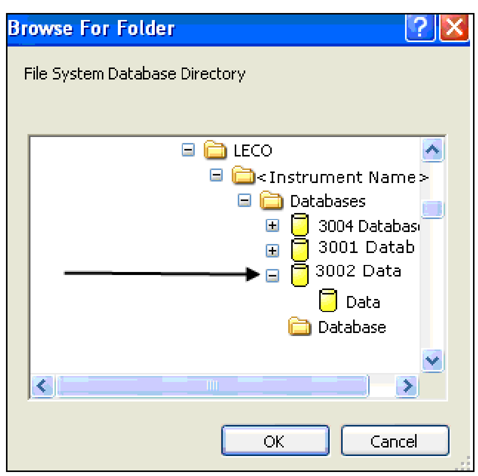
1) Create a folder in the desired location using *Windows* Explorer.

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.

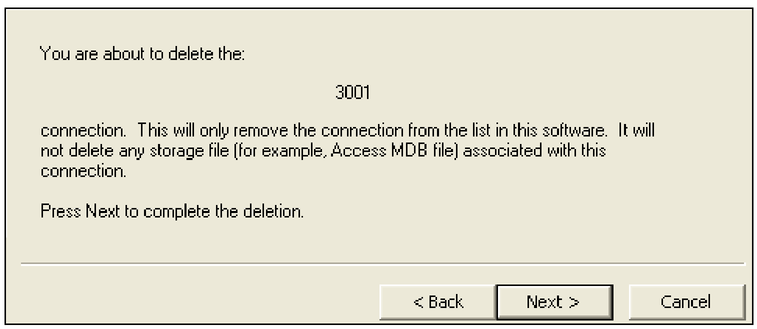
1. Exit the instrument software.

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.



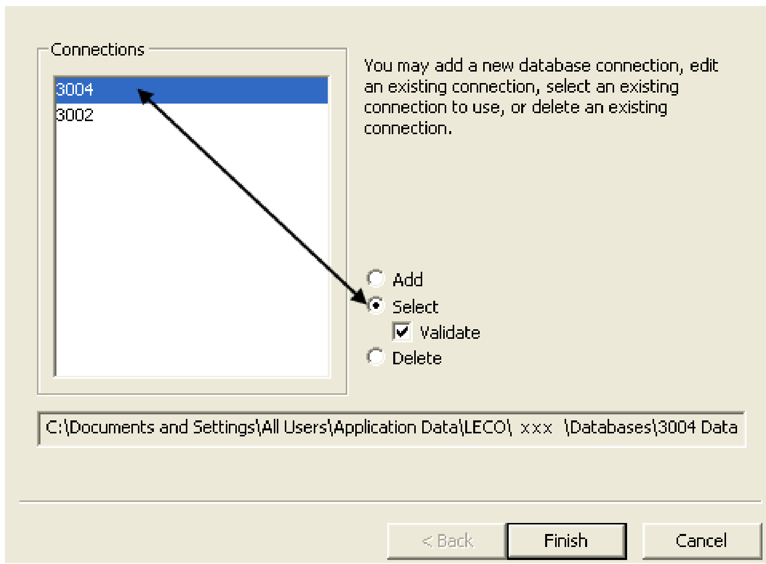
6. Select Next to remove the database connection.

Validating a Database

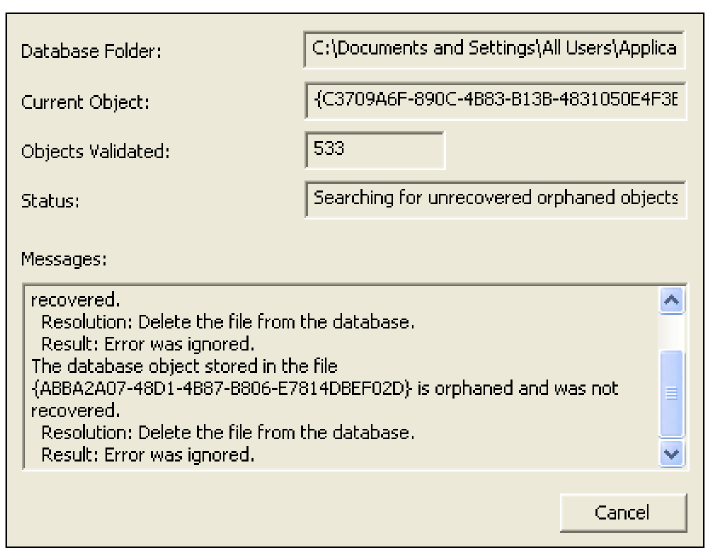
During database validation, the database files will be reviewed for corruption. If orphan objects are found, refer to Reviewing Orphan Objects, page 4–83.

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, click Select, and then select the Validate checkbox.
4. Select Finish. The Database Validation dialog box will display the status of the database validation.

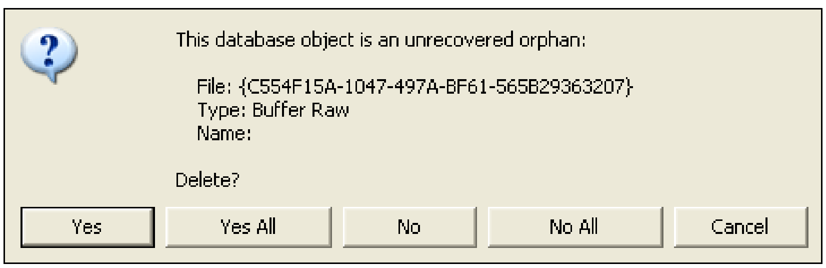


Reviewing Orphan Objects

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.

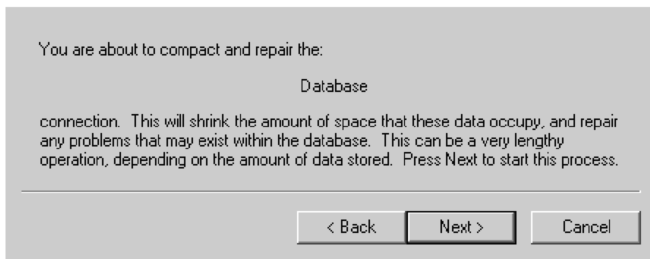
If all samples are displayed in the spreadsheet and there are no apparent problems with the database, then the orphans are likely objects that weren't completely removed from the database when they were deleted, and these orphans can be deleted. Select Yes to be prompted before deleting each orphan, 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 4–74.

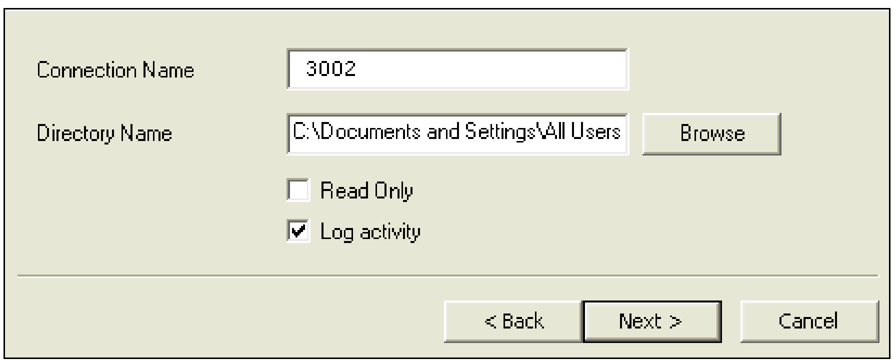
In the software, logging can be enabled to keep a record of all changes as they are made to the database. Logging provides a history of the changes made as well as the current database values.

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 4–85, and Enabling Logging for a New Database, page 4–86.

Enabling Logging for an Existing Database

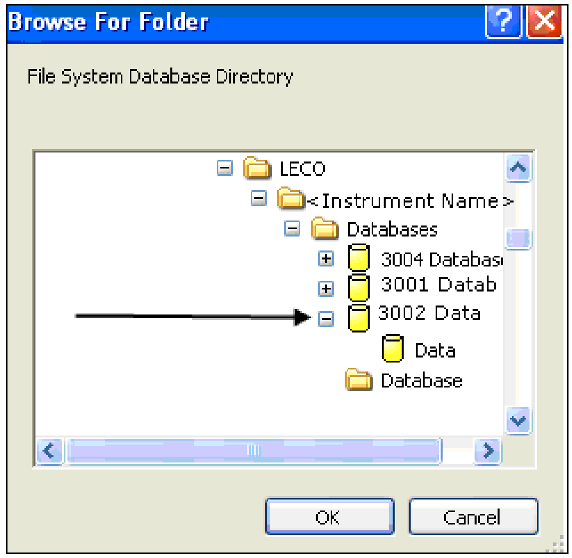
Connecting to an existing database allows you to use an existing file system database, which could be very important in a situation that required a software reinstall such as a system crash. This type of connection provides the means to reconnect to an existing database.

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:

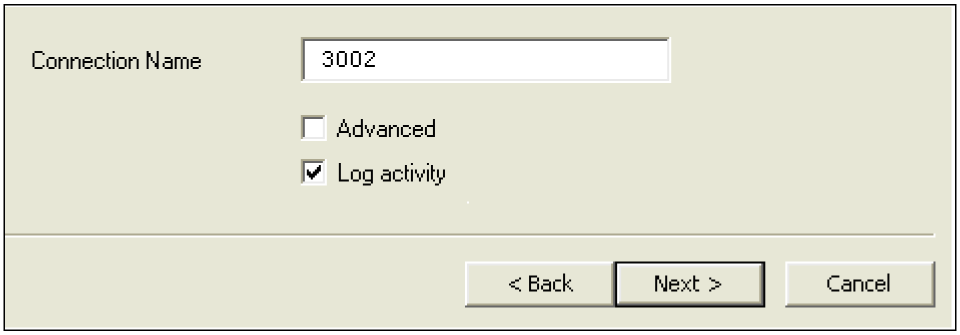
   A. Select Add.

   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:

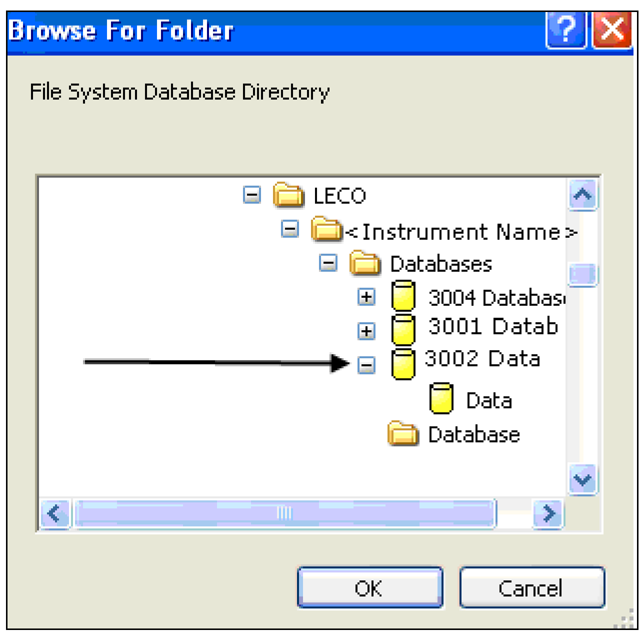
1) Create a folder in the desired location using *Windows* Explorer.

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.

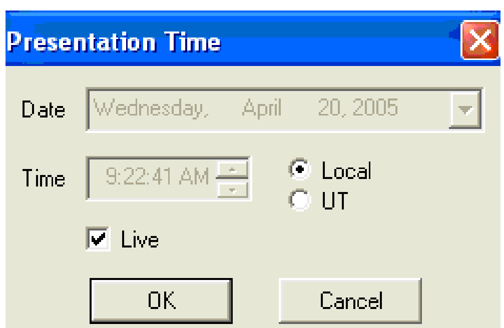
Database Menu

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 4–85.

Presentation Time

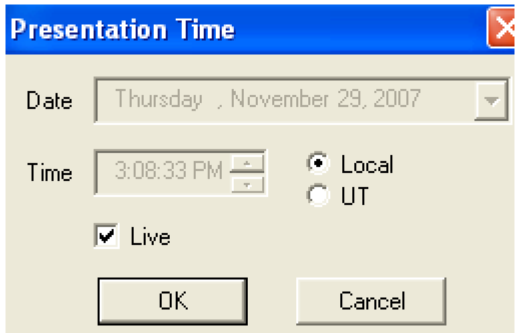
When logging is enabled for a database connection, the presentation time can be used to view the database as it existed at some previous point in time. For example, it could be used to view results before a change in calibration was performed. While a presentation time is set and the Live checkbox is 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.

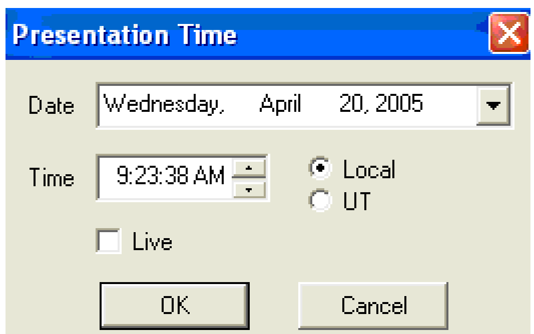


2. Select the time and date for the presentation time as follows:

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.



A. For Date, select the arrow to display a calendar.

B. 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.

C. 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.

1. Select the Database menu in the instrument software and select View History. The View Log dialog box will appear.

2. 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.

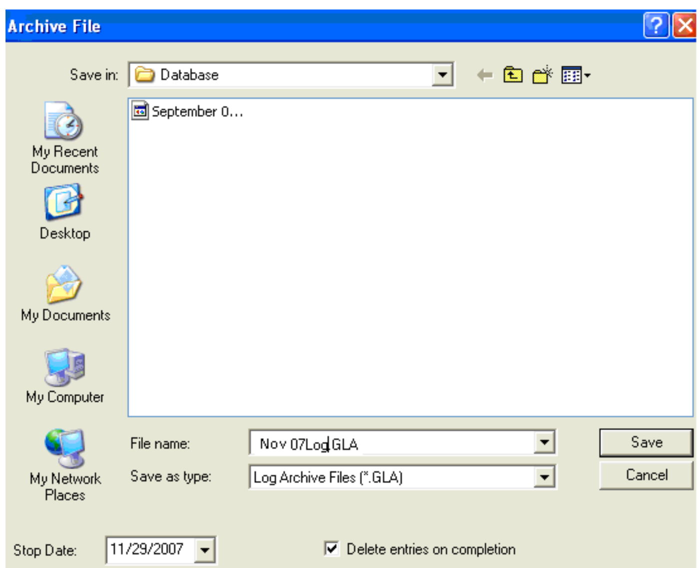
   User displays the username of the person who performed the action.

3. 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 4–76.

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 filename 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. Click 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

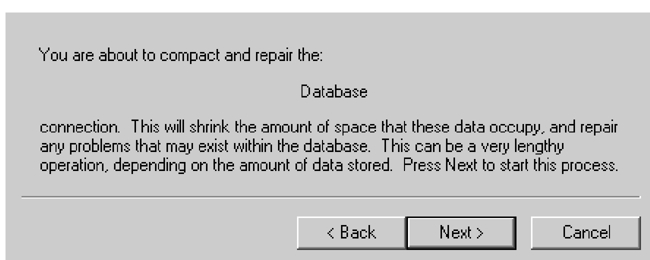
To remove results from a file system database, it is only necessary to create an archive log as explained in the following steps.

1. Create an archive log by following the steps in Archive Log, page 4–90.
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 4–90.
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

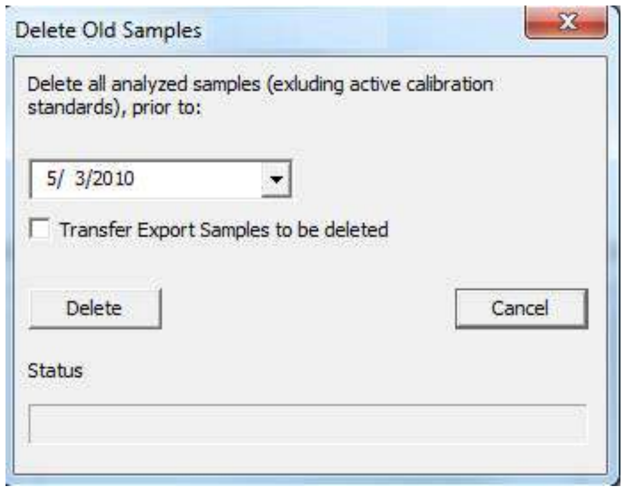
Use the following instructions to disable logging on a database in which logging is enabled.

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 4–93.
4. Select Delete, and follow the instructions provided by the software. Refer to Deleting a Database Connection, page 4–81, 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.

5 Operation

The Operation chapter explains how to prepare the sample for an analysis once the instrument is set up. First-Time Analysis, page 5–7, 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.

Illustrations

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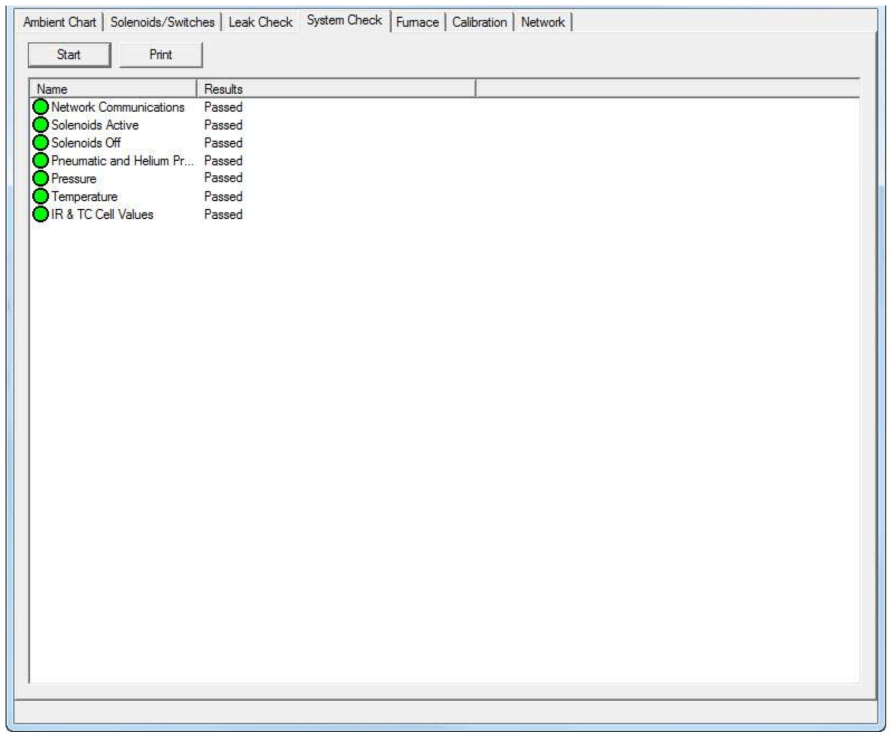
First-Time Analysis

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.

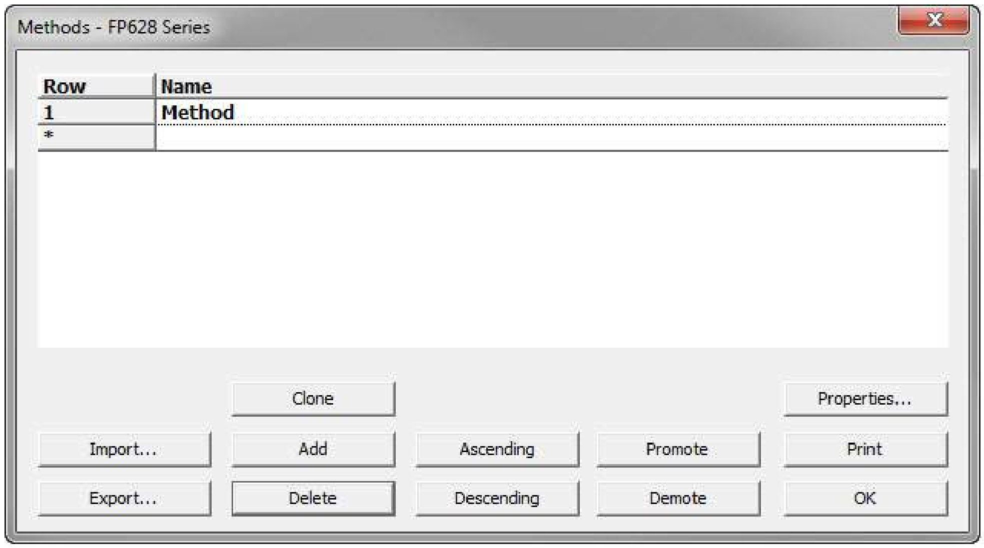


   C. Check the results of all systems. The circle in front of the system name should be filled in green and, in the results column, all systems should indicate “Passed.”

2. Perform a Leak Check, page 8–19, on both the oxygen and carrier gas systems.

3. Create a method. Refer to Creating and Modifying a Method, page 4–48, for additional information.

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



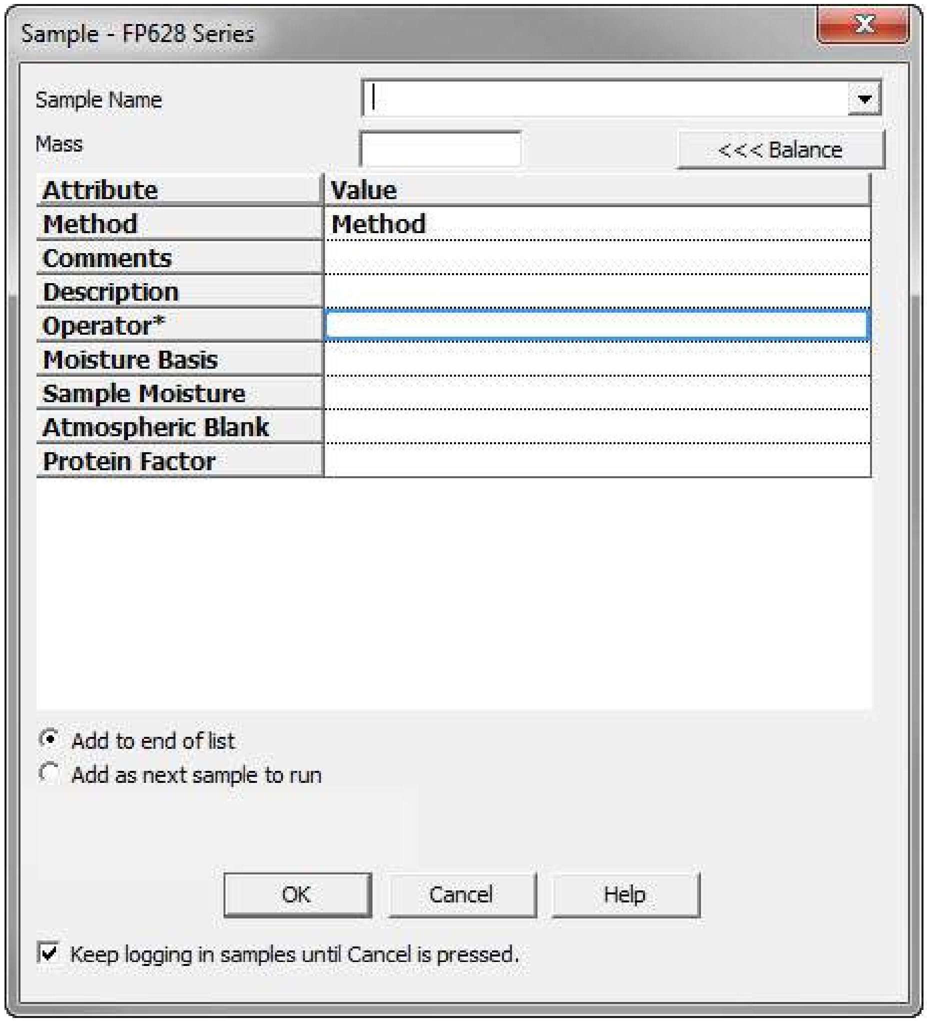
   B. Select Properties. The Method Properties dialog box will appear.

NOTE Unless otherwise directed by the LECO Application lab, verify 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 5–18, 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, page 5–18.

      1. Enter Blank for sample name, 1.000 for sample mass.

      2. Analyze blanks until a plateau is reached (typically ±0.001%). 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 4–23.

5. Analyze a blank. Refer to Analyzing a Blank, page 5–24, 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 0.0010% at 1.0 g for Helium models and 0.0020% at 1.0 g for Argon models. 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 5–34, for additional information.

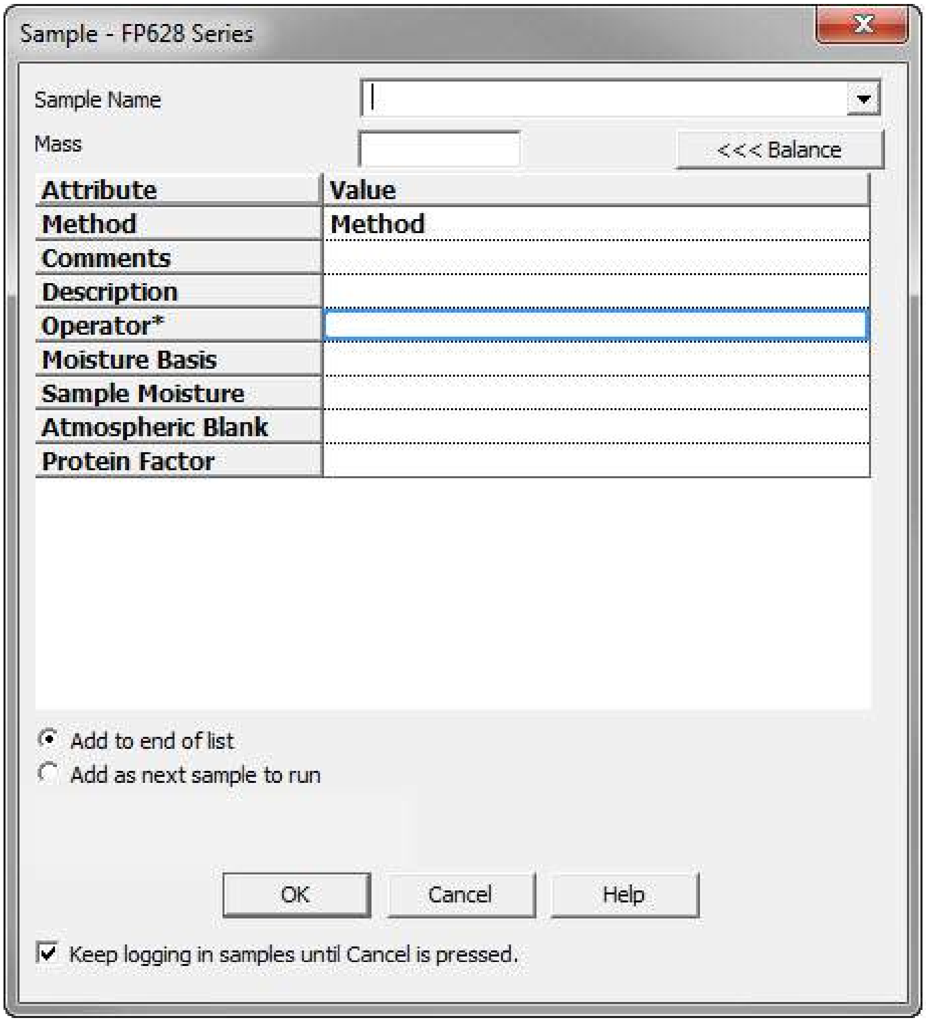
   A. In the spreadsheet, select the analyzed blanks to set the initial blank calibration value area. These should be the same blanks used in the previous step.

   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 analyze 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 5–19, 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 5–20, 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 5–24, for additional information.

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 (for example: 0.20xx, 0.20xx, 0.20xx, etc), the RSD should be <.5% RSD on the Helium model or <1.0% RSD on the Argon model, 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 5–33, for additional information.

    A. In the spreadsheet, select the Analyzed Standard Samples for Calibration.

        - These should be the same standard samples used in the previous steps. If using single standard for calibration, weigh, log in, and run Standards of the following weights: (3) 300 mg Standards, (3) 250 mg Standards, (3) 150 mg Standards, (3) 100 mg Standards, and (4) 50 mg Standards.

        - For calibrations that cover wide dynamic ranges, consult the LECO Applications Laboratory for support.

    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), page 5–10, 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 drop-down box and select another curve type. Refer to Standard Calibration, page 5–35, 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.

13. Calibration is complete. Analyze varying weights of the calibration sample to check the calibration.

Shutdown Procedure

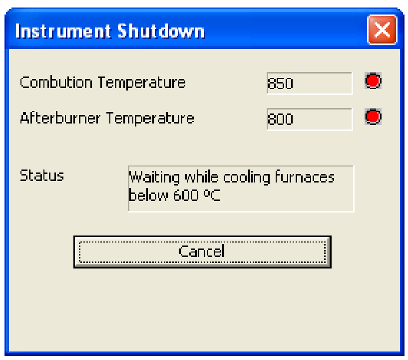
Use this procedure to safely power down and turn Off the instrument.

If Cancel is selected during this procedure, shutdown will be aborted and the furnace temperatures restored to their original settings.

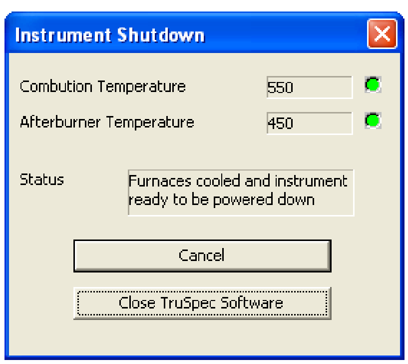
During shutdown, the gas is turned Off.

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 FP628 Software to exit the instrument application software.
4. Turn Off the AC power switch.

Sample Preparation

Each sample holder type will require its own blank value and should be used in the main calibration.

Samples should be homogenized prior to encapsulation.

Sample presses may be used to maximize sample size.

Gel Capsule Method

NOTE Gel Capsules should only be used for nitrogen-only analysis. Sample size is dependent upon the sample type, desired precision, and optimum performance. Contact the LECO applications laboratory for further information.

1. Place the sample cup holder on the balance.
2. Place the gel cap (small, medium, or large) into the sample cup holder and tare the balance.
3. Remove the capsule from the sample cup holder and add the sample to the capsule.
4. Place the capsule in the sample cup holder and weigh.
5. Record the mass in the spreadsheet or automatically through the print function on the balance.

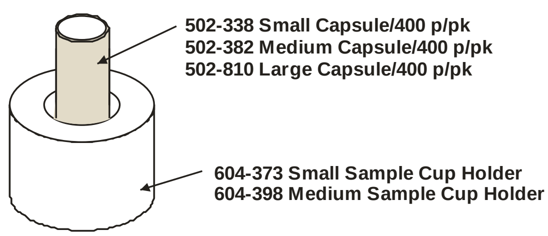


Figure 5-1
Sample Preparation—Gel Capsule Method

NOTE For analysis of multiple samples, install and use the 619-180 Carousel Assemble then load the samples in the proper order for analysis.

Tin Foil Method

Using the Quick Sampler

1. Place the small or large foil on the balance and tare.
2. Place the foil holder on a work surface and center the small or large foil on the holder.
3. Pull the quick sampler plunger up by the handle end to make room for the sample in the bottom of the tube and press the tube into sample material. Make sure the sample is firmly packed.
4. Place the end of the tube in the center of the foil and work the tube into the foil by pushing gently and rocking the tube back and forth.
5. Firmly holding the tube in place, push the plunger down. When the sample is in the foil, remove the sampler.
6. Crimp the foil closed with tweezers.
7. Holding the sample in place with the tweezers, lift the sample up off the holder.
8. Enter the mass in the spreadsheet or automatically by pressing print on the balance.

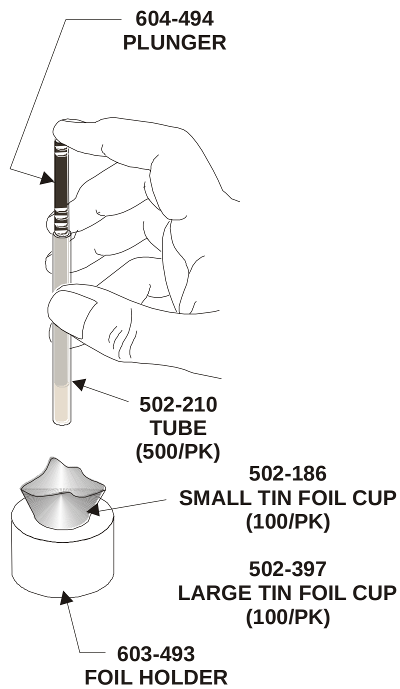


Figure 5-2
Sample Preparation—Quick Sampler Method

Manual Preparation

1. Place the sample cup holder on the balance.
2. Place foil into the sample cup holder and tare the balance.
3. Remove the foil and the sample cup holder from balance and add sample to foil.
4. Place the sample cup holder and foil on balance and weigh.
5. Remove the foil from the sample cup holder and twist to seal.
6. Enter the mass in the spreadsheet or automatically by pressing print on the balance.

NOTE Sample size is dependent upon sample type, desired precision, and optimal performance.

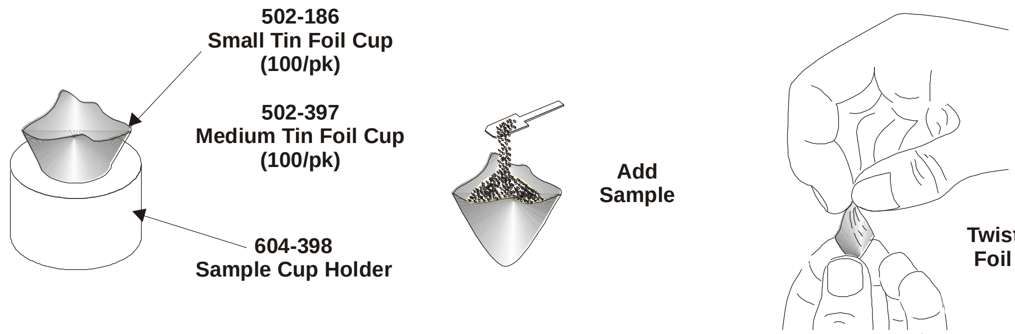


Figure 5-3
Sample Preparation—Manual Method

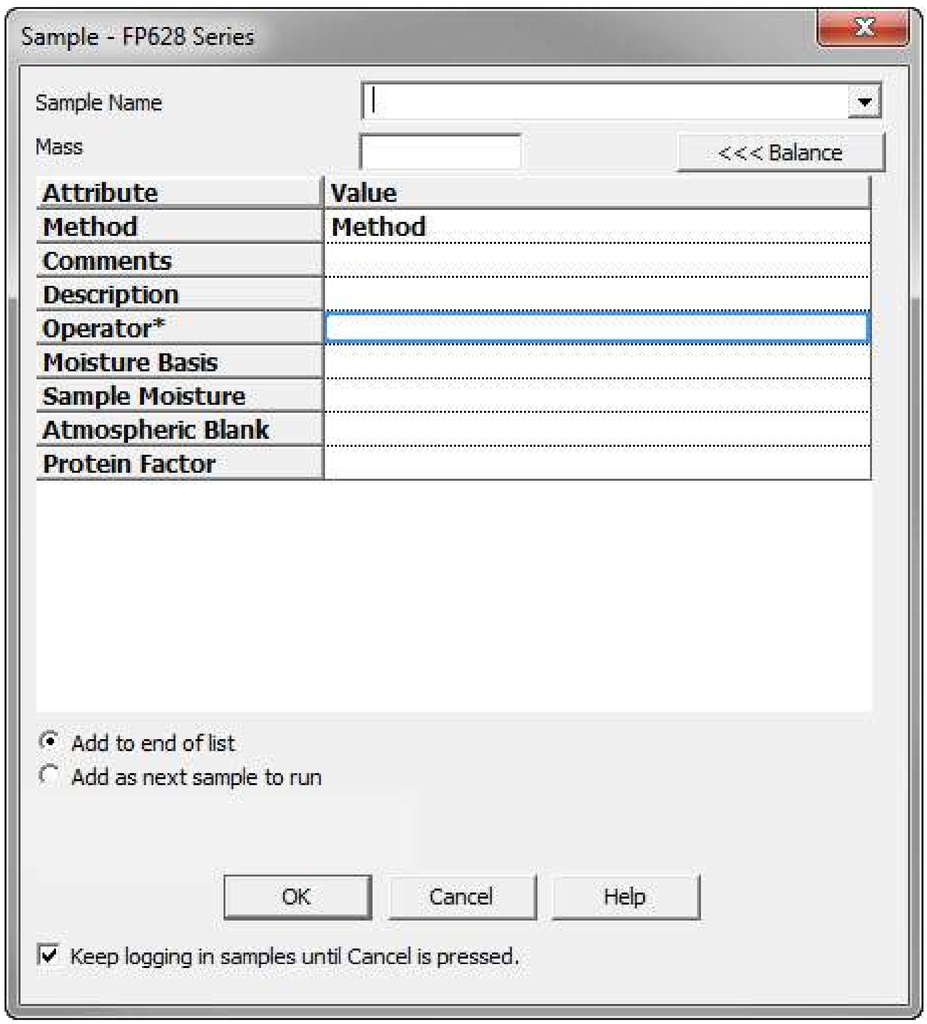
Login

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 4–48.

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 the Glossary, page 12–1, for Blank Login definitions.
5. Select OK to log in the blank.

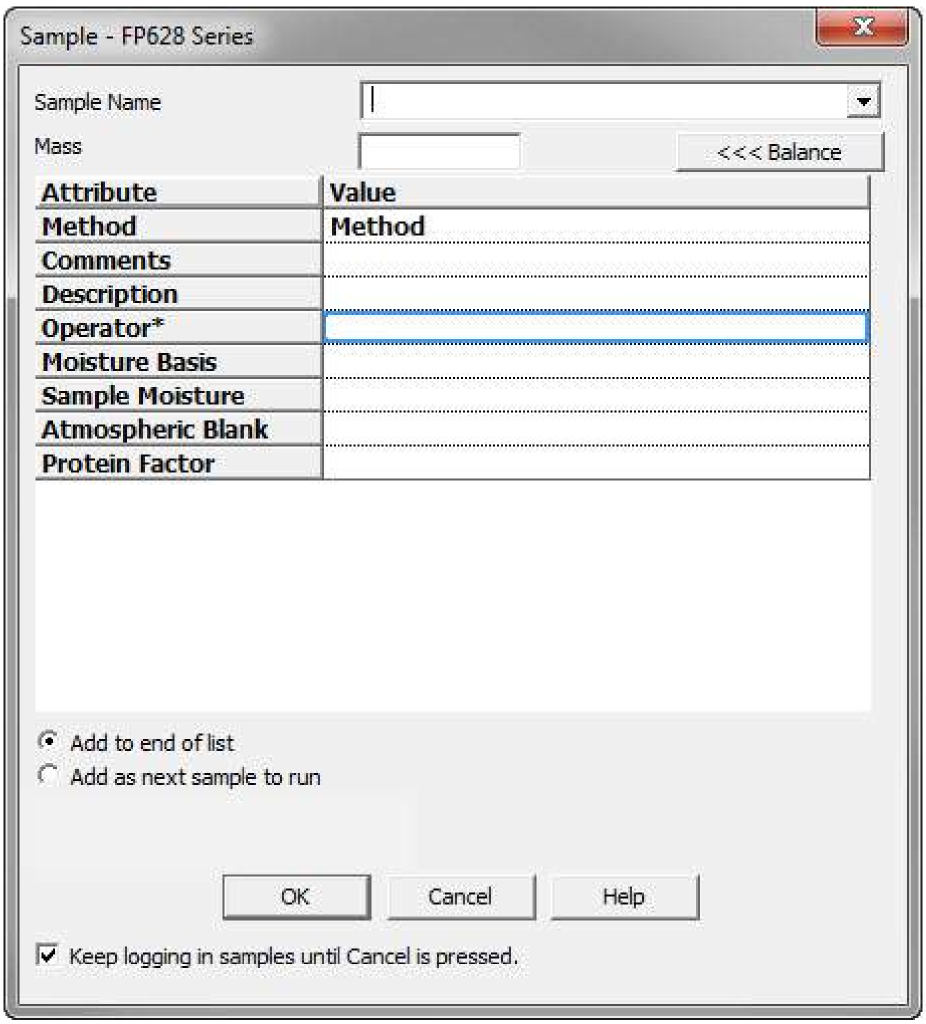
Sample Login

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 4–48.

Prepare the sample for analysis. Refer to Sample Preparation, page 5–15, 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 5–20, 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.

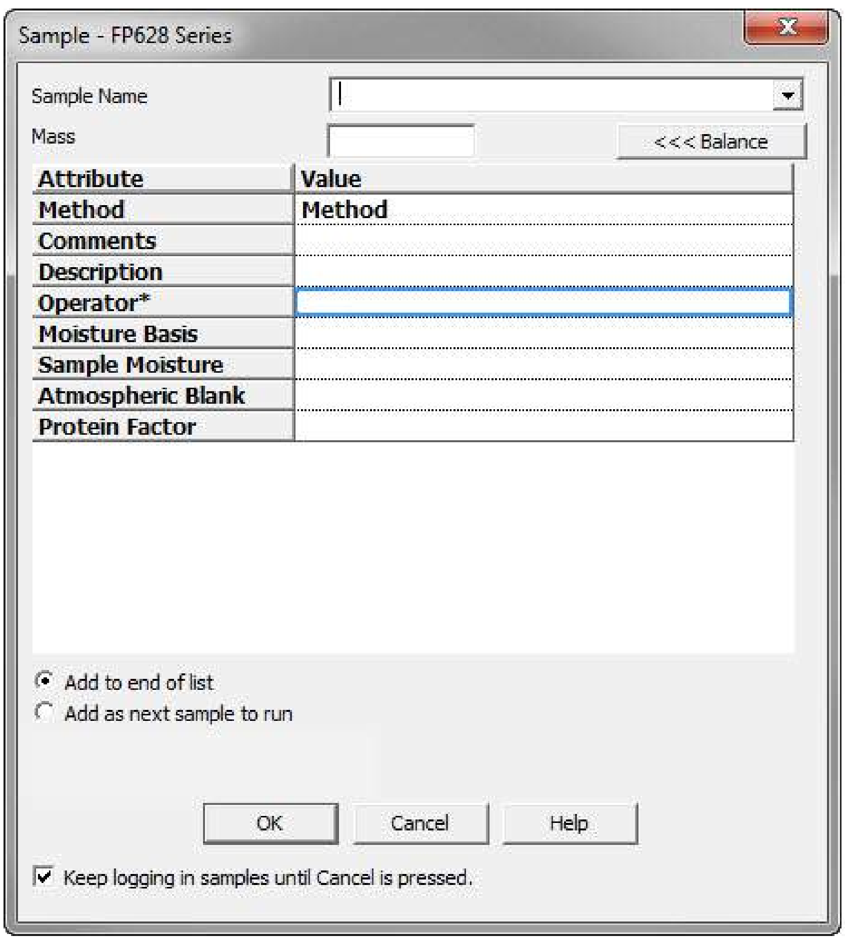
Correcting for Moisture

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.

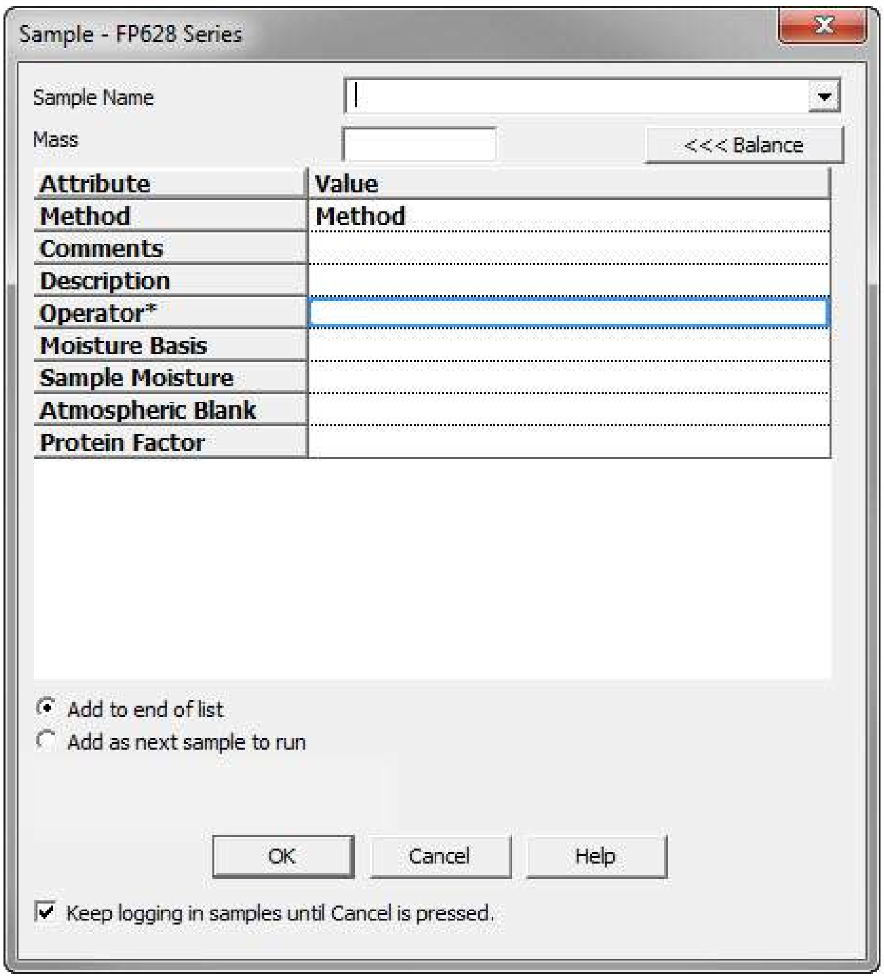


2. Select the Sample Moisture edit box and enter a value.
3. Select the Moisture Basis edit box and enter a value.
4. Select OK.

Correcting 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. Typically, for a sample mass of 0.25g, approximately 0.04% nitrogen 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.

NOTE 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.

Entering 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 3–3, 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 crucible on the balance.
2. Press Tare.
3. Place the sample in the crucible.
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 5–34, for additional information.

NOTE Before proceeding, the steps in Blank Login, page 5–18, 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 follow Defining Calibration Standards, page 4–62, and Logging in using Calibration Reference Material, page 4–63.

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 5–34, Standard Calibration, page 5–34, and Sample Login, page 5–19, 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 5–24, must be completed.

From the Samples menu, select Abort. The analysis in progress will be aborted.

Analyzing Multiple Samples

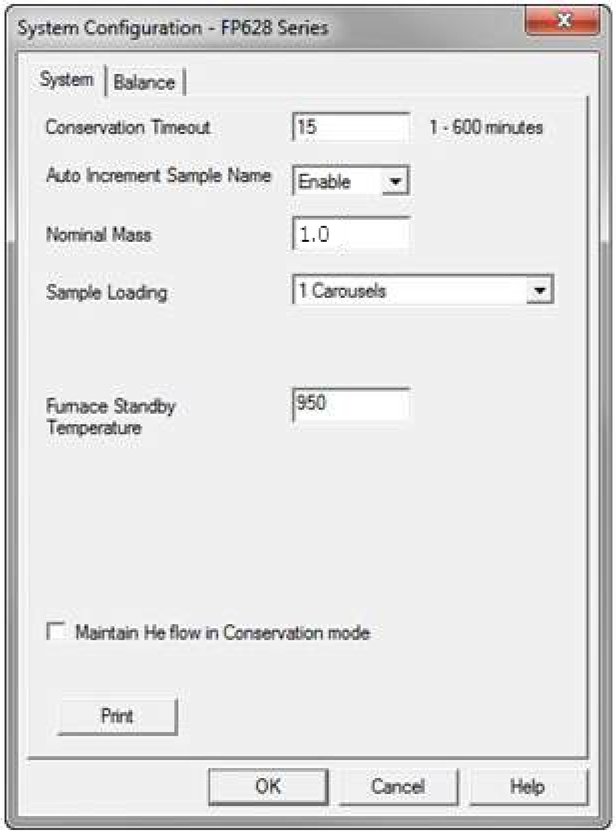
This procedure programs the instrument to analyze a group of samples without the aid of an operator during analysis.

NOTE Before proceeding, the steps in Creating and Modifying a Method, page 4–48, Blank Calibration, page 5–34, and Standard Calibration, page 5–34, must be completed.

Prepare the samples for analysis. Refer to Sample Preparation, page 5–15, for additional information.

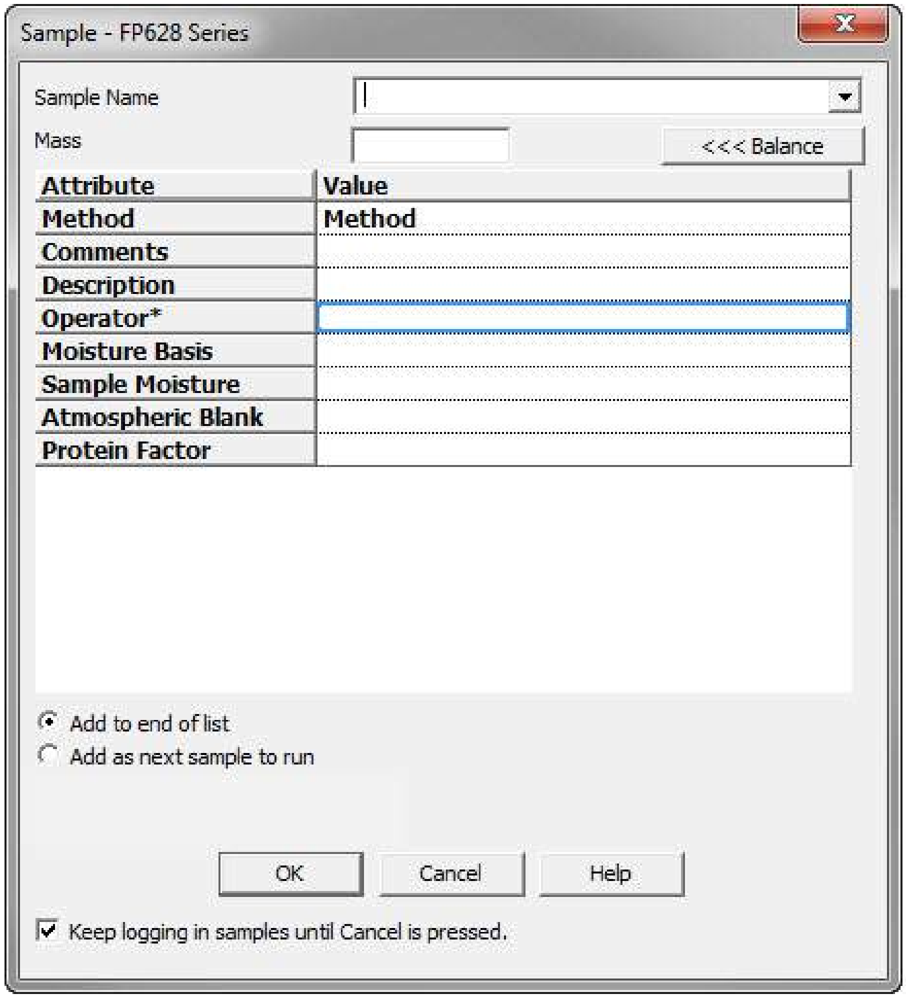
FP628—Install and use the 619-180 Carousel Assembly and then load the samples in the proper order for analysis.

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.



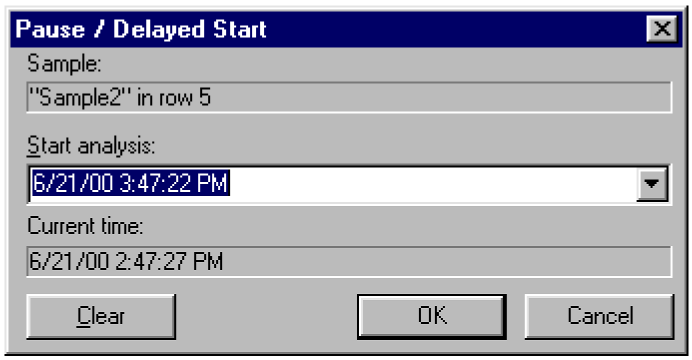
6. Log in a sample to analyze.
7. Select the checkbox at the bottom of the window to keep logging in samples.
8. Repeat step 6 until all samples are logged in.
9. Select Cancel to close the Sample Login dialog box.
10. View the location number of the first sample in the spreadsheet and compare it to 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 4–48.

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.

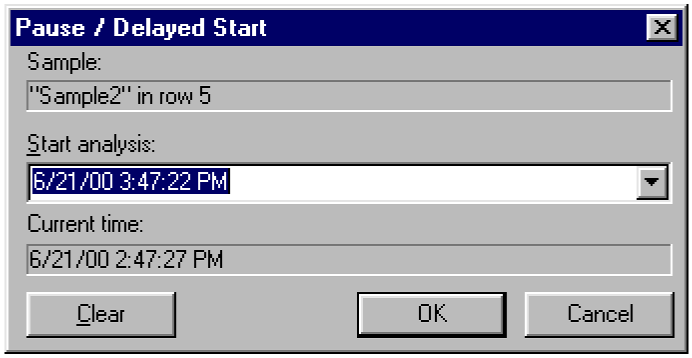
Pausing Analysis

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 5–25, 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.



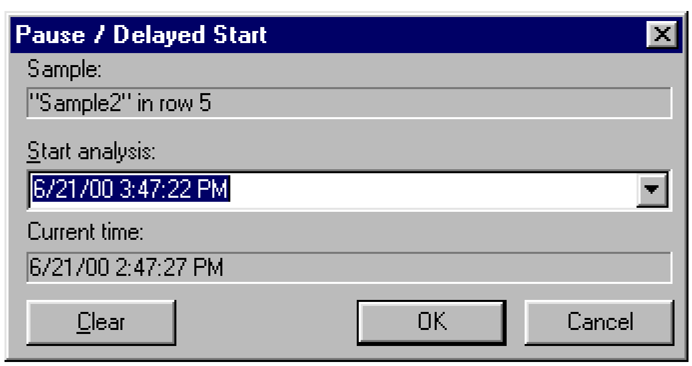
3. In the highlighted field, enter the date and time to restart analysis. The date and time that appears may be edited. The format for entering the date and time is [06/01/2000 4:30:00 PM]. A space should be inserted after the date and time.
4. Select OK to program the pause. A clock symbol will appear 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 5–25, must be completed.

1. 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.



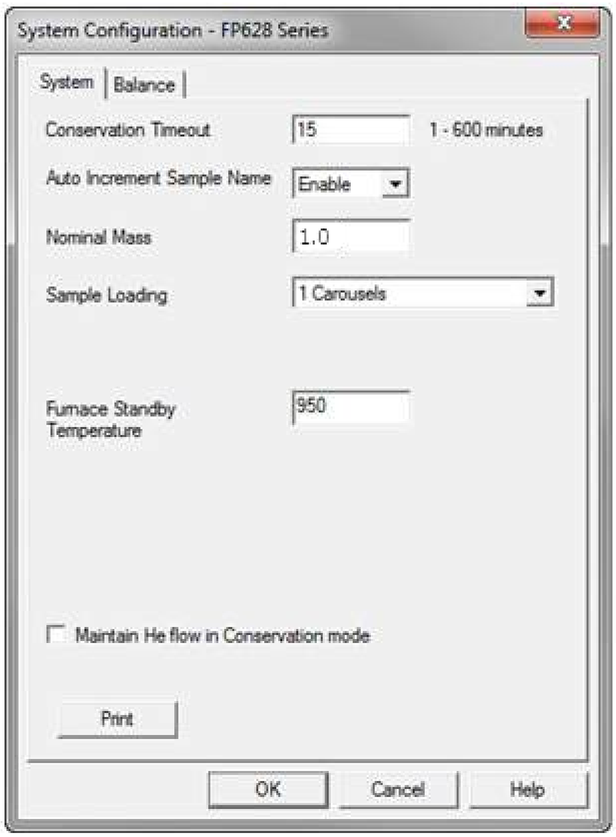
3. Select Clear. The programmed type, delay, or pause will be removed.

Liquid Sample Analysis

NOTE In order to perform a liquid analysis, the liquid loading head and the liquid autosampler must be installed. Refer to Liquid Autosampler, page 3–11.

Analysis of liquid samples is very similar to solid samples with the exception of how they are loaded into the determinator. Use the following procedure to perform analysis of liquid samples.

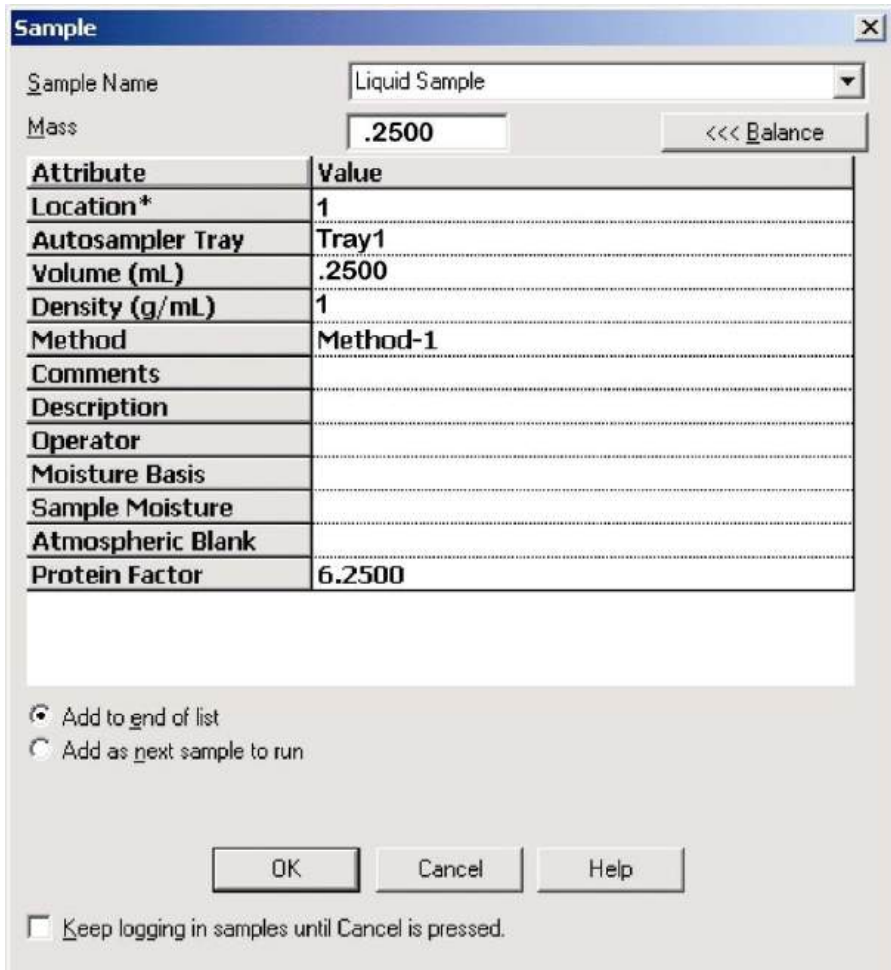
1. From the Configuration menu, select system. The system configuration screen will appear.
2. Select the drop-down arrow in the sample Loading selection box and select Liquid Autosampler. Refer to System Configuration, page 4–34.



3. Select the drop-down arrow in the Liquid Autosampler Port selection box, and select the proper Autosampler Port. This is the computer serial port that the autosampler is connected to. It is not necessary to configure this port. The software automatically configures itself when the autosampler is selected.
4. From the Configuration menu, select Method. Select or create the proper analysis method. Refer to Liquid Autosampler, page 4–54.
5. Fill the wash vials with the proper wash solution.
6. Empty the waste vial if necessary.

7. Prepare the sample vials and insert the tray in the tray holder.

8. Select the Samples menu and select Login. Log in the desired samples. The location, volume, and density must be entered. After volume and density are entered, the software will calculate the mass.



9. Select the Samples menu and select Analysis, or press F5 to start analysis. Refer to Analyzing a Sample, page 5–24, for more information.

Liquid Sample Login Definitions

NOTE In addition to the definitions listed as follows, refer to Sample Login Definitions, page 5–20.

Location—The sample location number. Refer to Figure 5-4, page 5–32.

Autosampler Tray—Select the drop-down arrow and select the autosampler tray. If only one tray is used, select Tray1.

Volume (ml)—The volume of sample drawn into the syringe.

Density (g/ml)—The sample density (grams per ml).

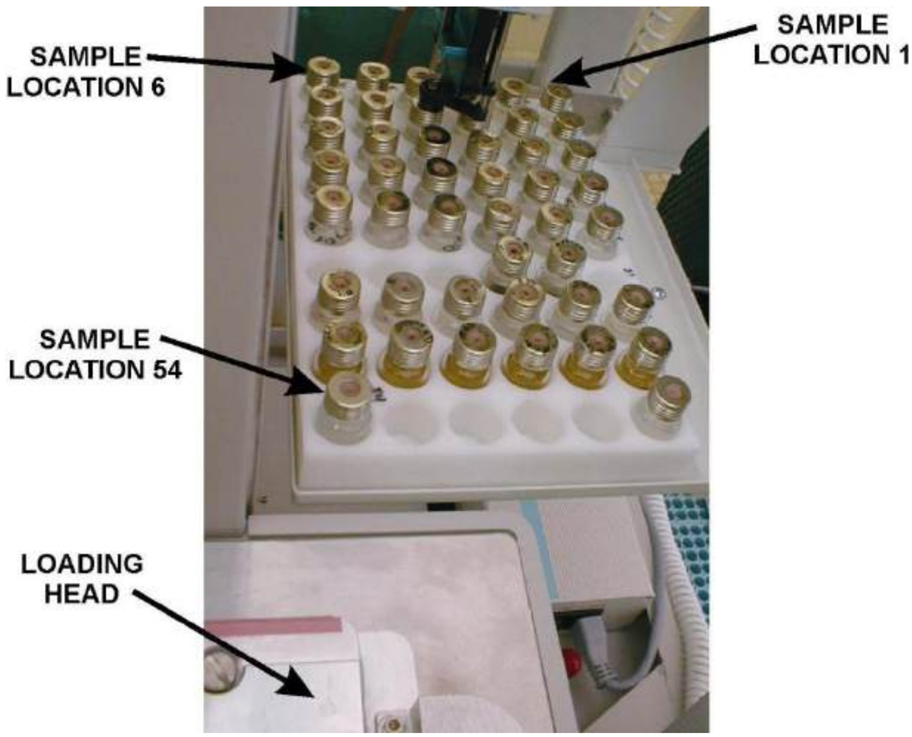


Figure 5-4
Autosampler Tray

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 daily 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 5–34.

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 5–35.

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 5–37. 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).

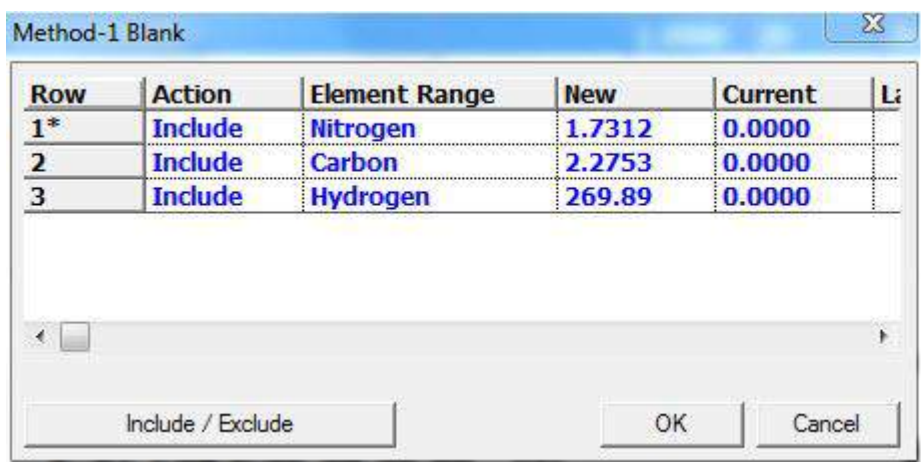
Replace Drift Standard

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 5–40.

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.



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 5–37, when performing this procedure.

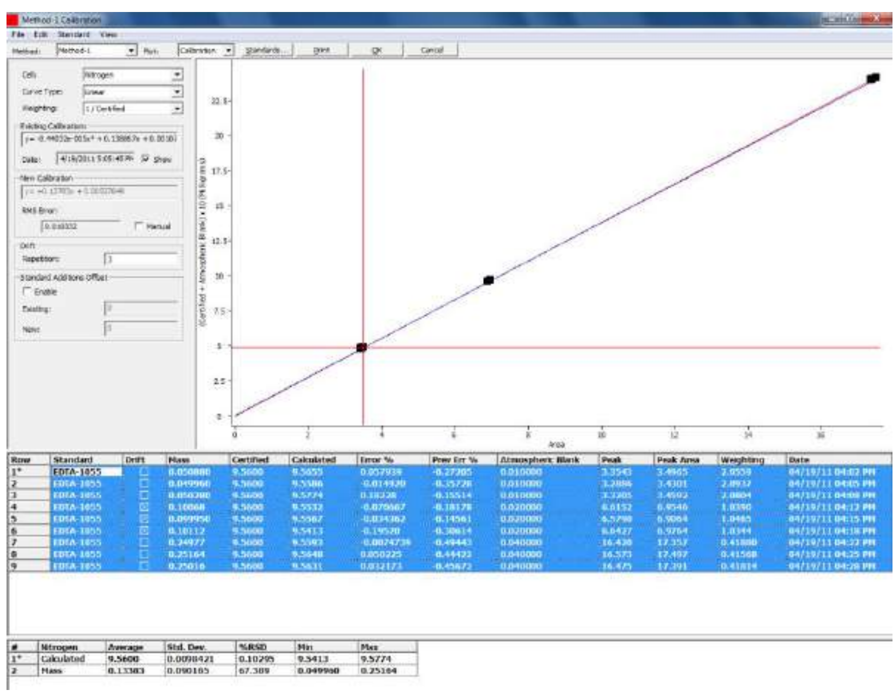
The instrument Blank should be calibrated before performing standard calibration. Refer to Blank Calibration, page 5–34.

LECO recommends multipoint calibrations that employ 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 5–19.

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 then 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 that represent 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 then 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 does not 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 ±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 5–35, for additional information.

A blank calibration should be performed before every drift correction. Refer to Blank Calibration, page 5–34, for additional information.

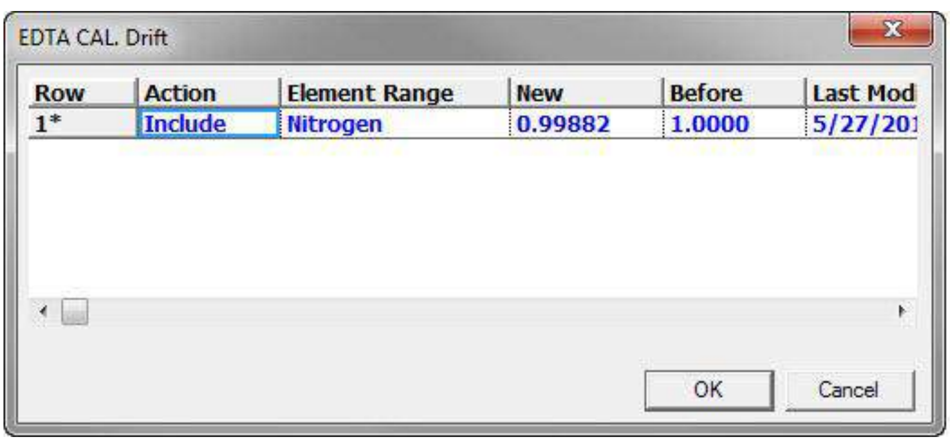
The drift standard should be homogenous and return precise results.

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.



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.

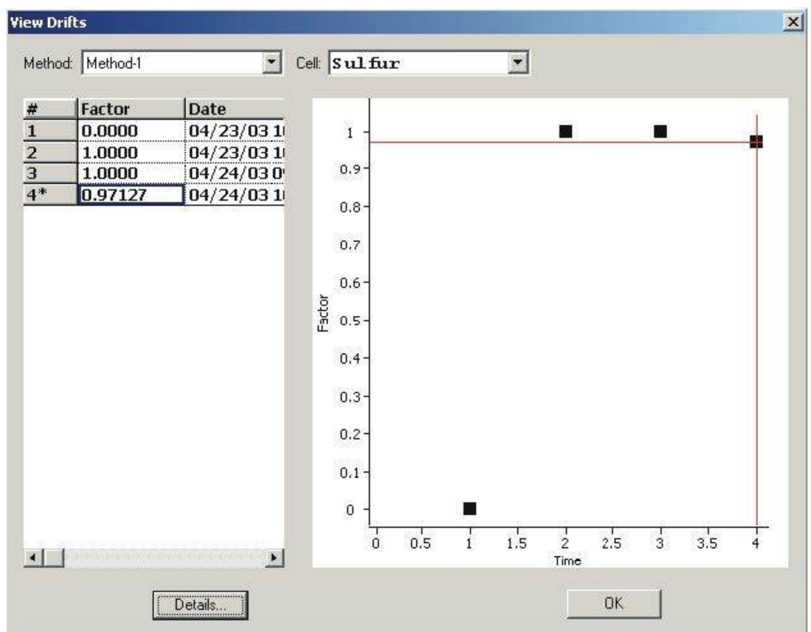
   - If more than one drift standard is selected, the drift factor will be the average of the selected standards.

   - 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.

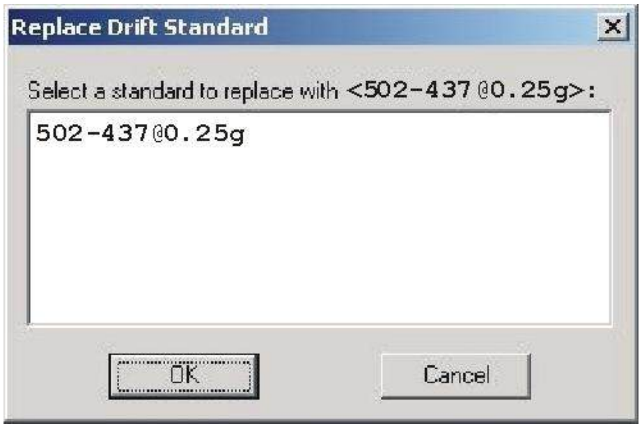
Replacing Drift Standard

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.

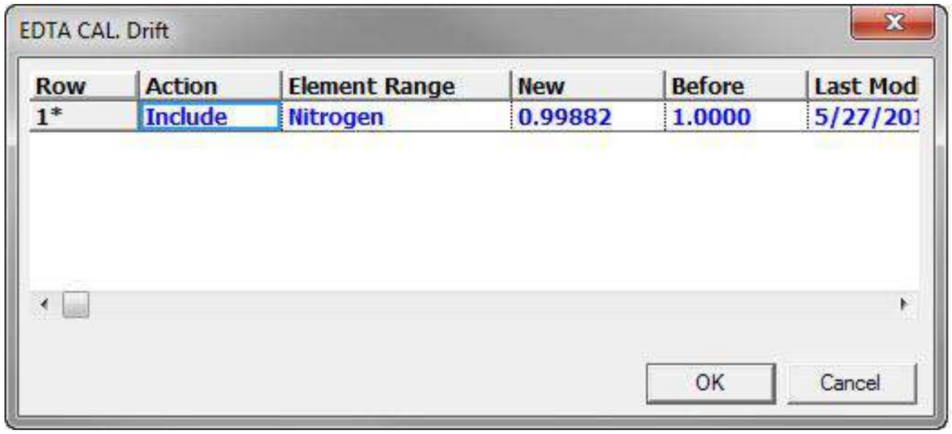
A Drift Correction must be performed prior to completing the proceeding Replace Drift Standard procedure. This ensures that the detector response from the current drift standard can approximate the detector response from the replacement drift standard.

1. Select 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 5–36.
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 select Drift.

13. Select drift from the fly-out menu. The drift calibrations screen will appear.



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.

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 4–48.

1. 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 Data

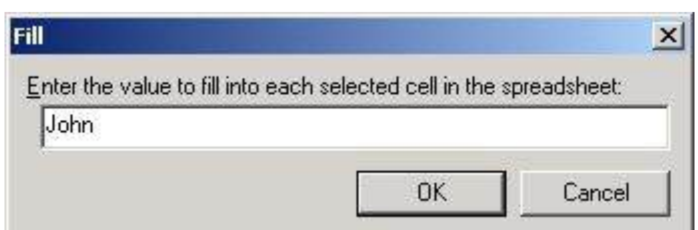
A group of cells in the spreadsheet can be quickly filled with the same data. As an example, the method could be changed in a group of logged in unanalyzed samples.

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.

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 is 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, select 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.

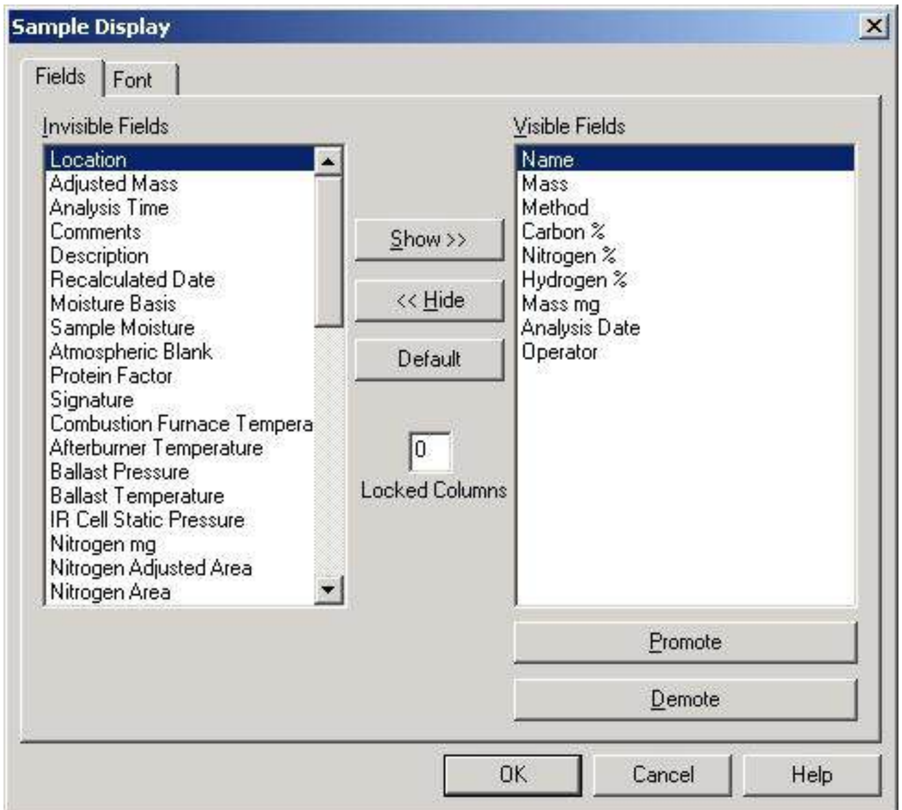
Displaying Protein Results

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 5–45.

A protein factor may be entered in the spreadsheet if the field is visible.

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



2. Select Protein % from the Invisible Fields edit box.
3. Select Show to move Protein % from the Invisible Fields edit box to the Visible Fields edit box.
4. Select OK to display protein % and protein factor in the spreadsheet.

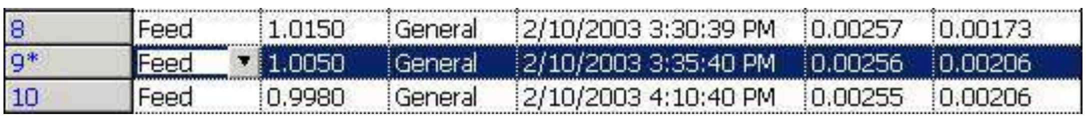
Typical Protein Factors

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

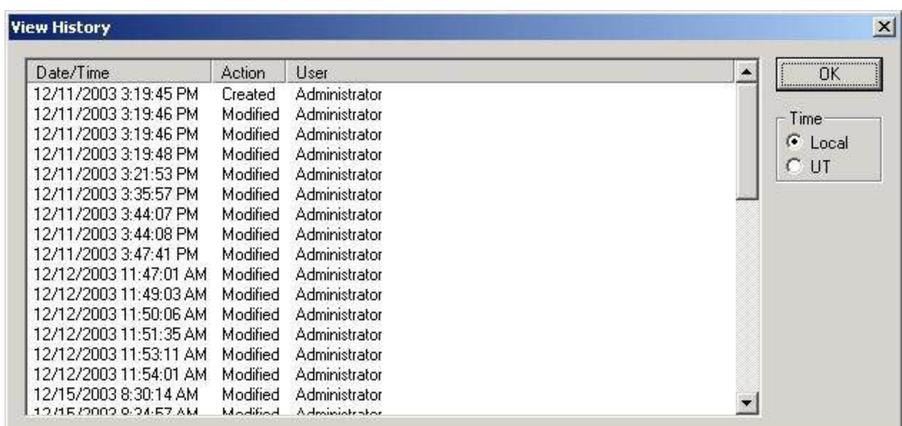
Viewing History

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 the history of.



2. Select the Samples menu and select View History. The View History screen will appear. Refer to View History Definitions, page 5–46.



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 5–47.

1. Select on 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 dialog box will appear.

   A. A name will appear in the Name text box. It will be the name of the logged-on Microsoft® Windows® user. If desired, the name can be changed. It is suggested that the current operator's name be used.

   B. If desired, a description can be entered in the Description text box. This can be additional information about the sample or an event that took place. Any text can be entered.

C. 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. UT displays the universal time that corresponds with the UTC (Universal Coordinated Time) as defined by the National Bureau of Standards.

D. 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 5–46.

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 on 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 select View Signatures. The View Signatures screen will appear.

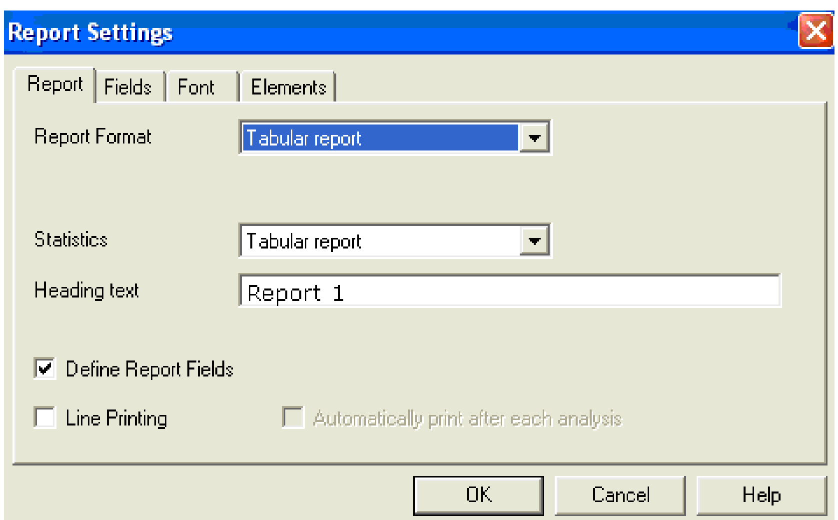
3. Select OK when finished viewing the signature information.

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.

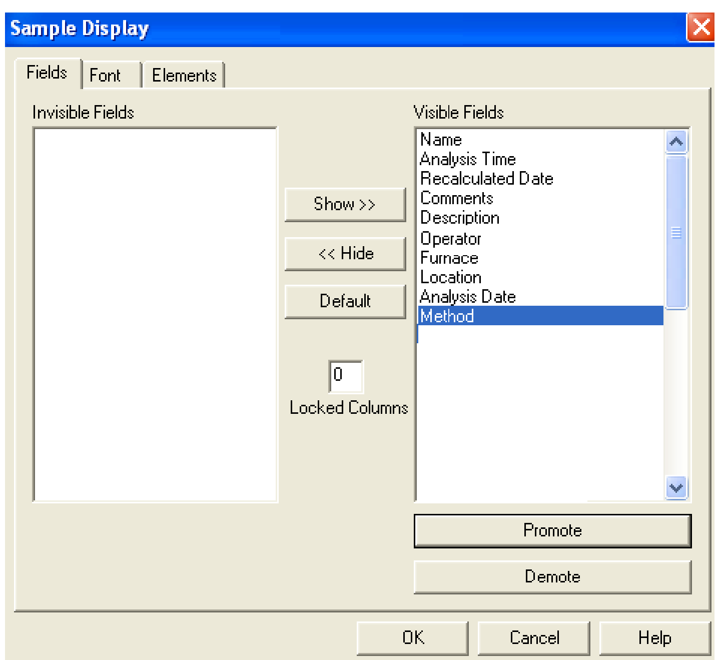
C. For Heading Text, enter a title for the report, if desired.

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 5–48. Fields that appear vary, depending on the instrument.

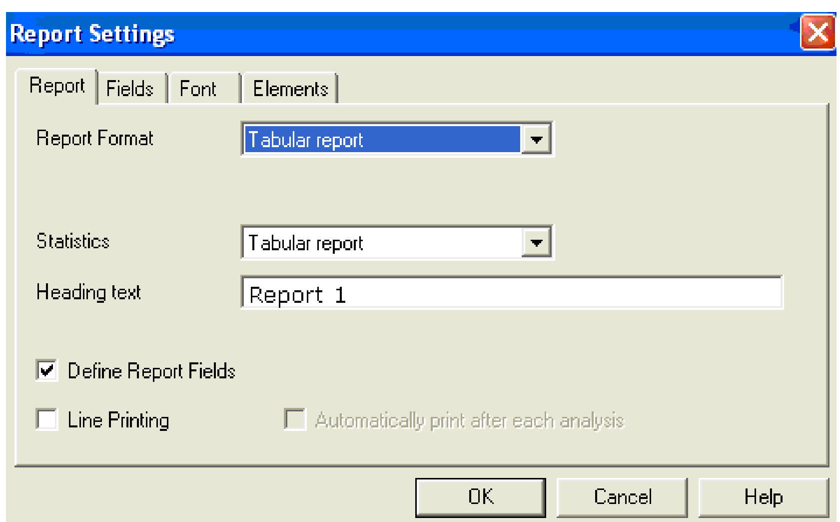


- To display a Field that does not appear in the report, select the field from Invisible Fields, and then select Show. The Field will automatically move to the Visible Fields column.
- To remove a Field so that it does not display in the report, select the field from Visible Fields, and then select Hide. 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 4–25.
7. Use the Elements tab to determine the elements that display in the report.

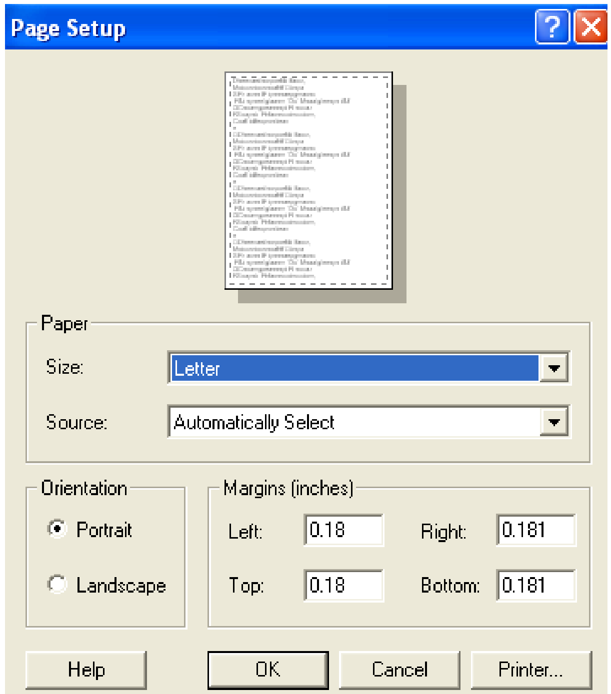
Printing from the Software

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 5–48, 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 5–48.

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.

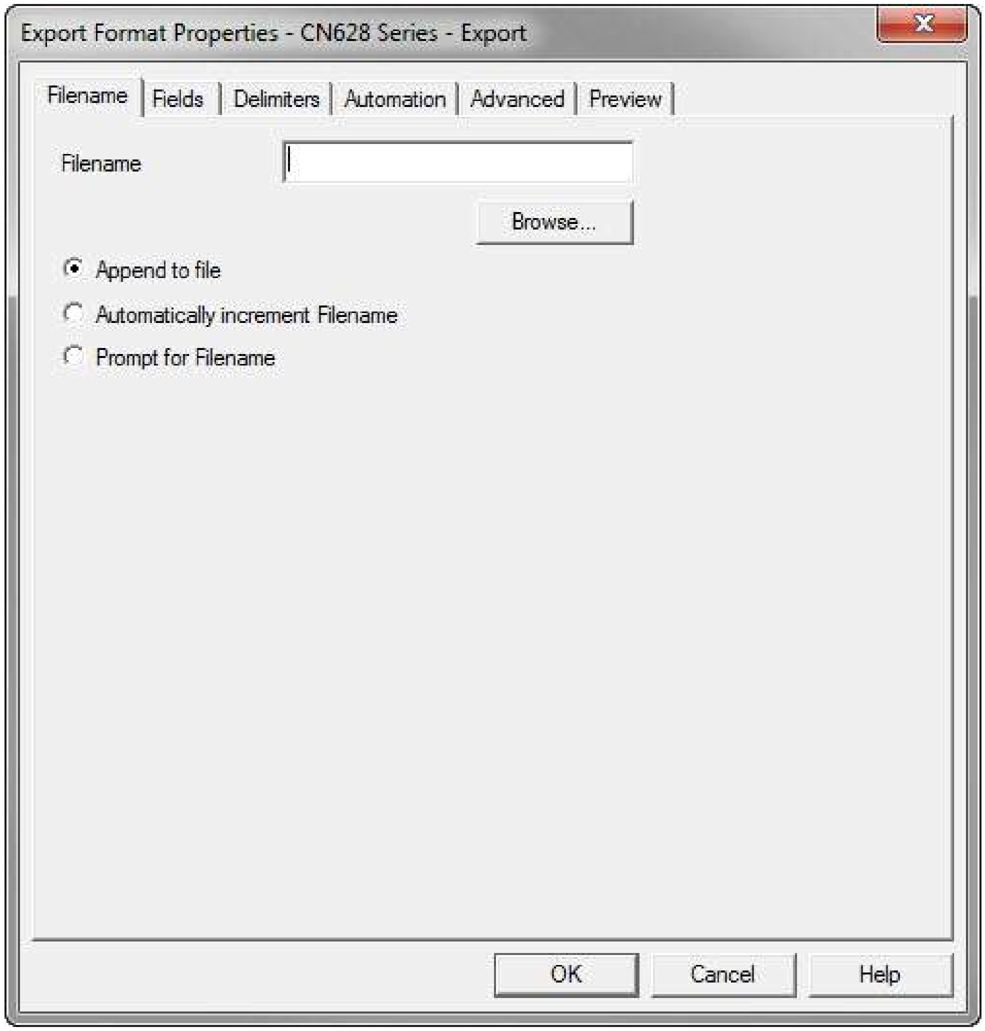
Export Configuration

Filename

1. Select the Configuration menu and select Text Export Formats. The Export Formats screen will appear.

2. To move a selected method up toward the top of the list, select it and then select Promote.
3. To move the selected method down toward the bottom of the list, select it and then 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 filename 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 5–54.
9. Select OK to save the changes and exit.
10. Select Cancel to exit this procedure without making changes.

Export Definitions

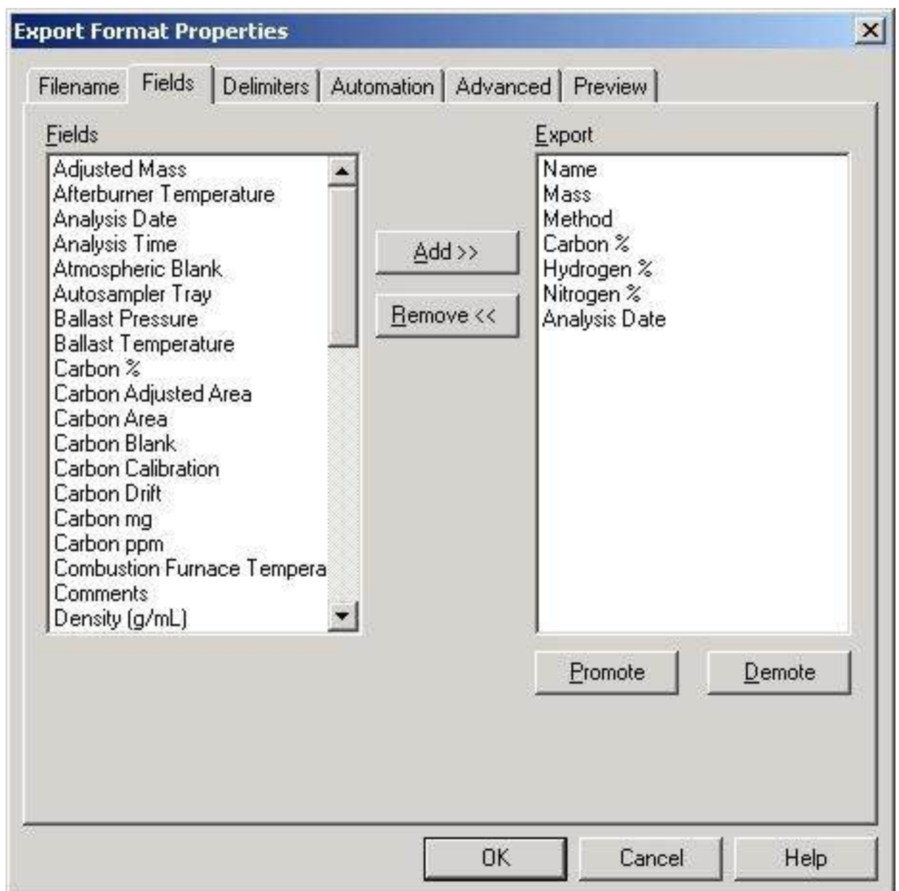
Append to File—When selected, the highlighted sample analysis data will be attached to the previously saved file.

Automatically Increment Filename—If the filename contains numbers, they will automatically be incremented by one when the file is saved.

Prompt for Filename—When selected, the export filename screen will appear when exporting a file, prompting the operator to enter a filename.

Fields

1. Select the Fields tab. The Fields screen will appear. Select the desired fields to export in the file.

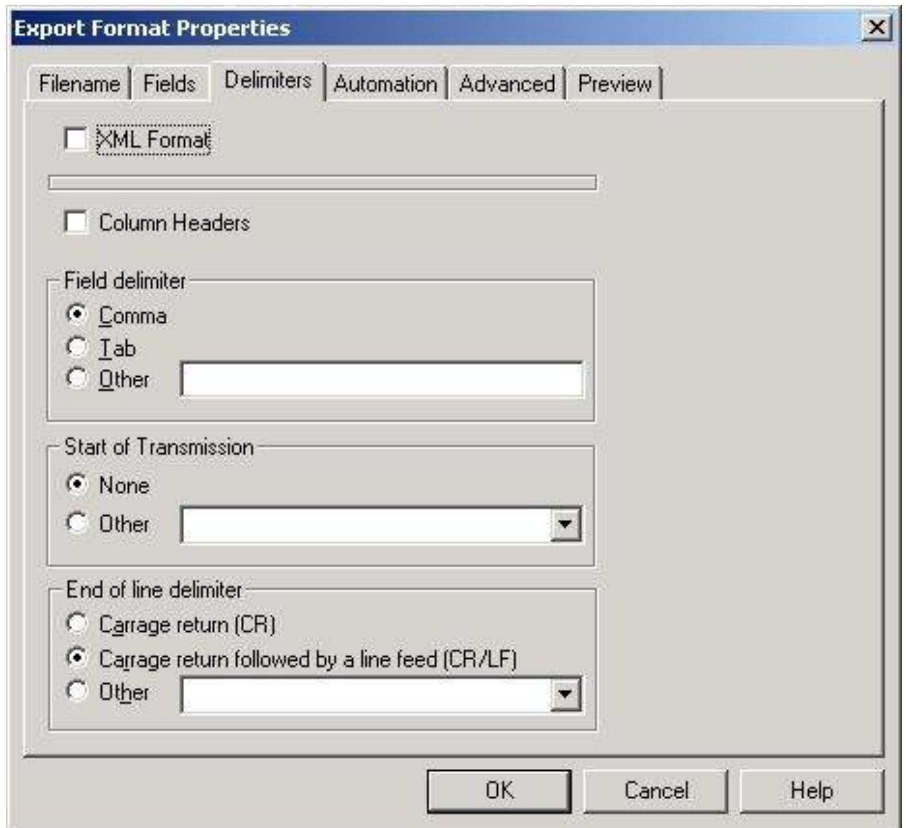


2. To Add an invisible field, select the field and select Add.
3. To Remove a visible field, select the field and select Remove.
4. To move a selected field up toward the top of the list, select Promote.

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

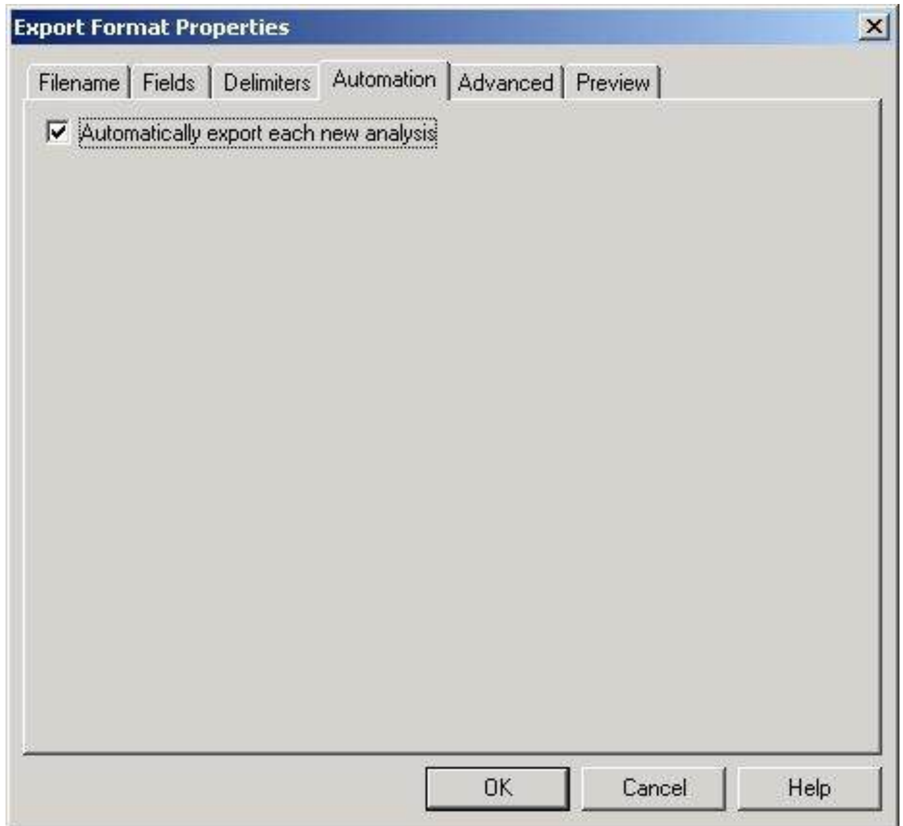
1. Select the Delimiters tab. The Delimiters screen will appear. Select the desired delimiters to export in the file.



2. Select XML Format to export the text data in XML format. If XML Format is selected, no other parameters in the screen can be configured.
3. Select Column Headers to transmit the column header.
4. Select or enter the Field Delimiter, Start of Transmission, and End of Line Delimiter.
5. Select OK to save the changes and exit.
6. Select Cancel to exit this procedure without making changes.

Automation

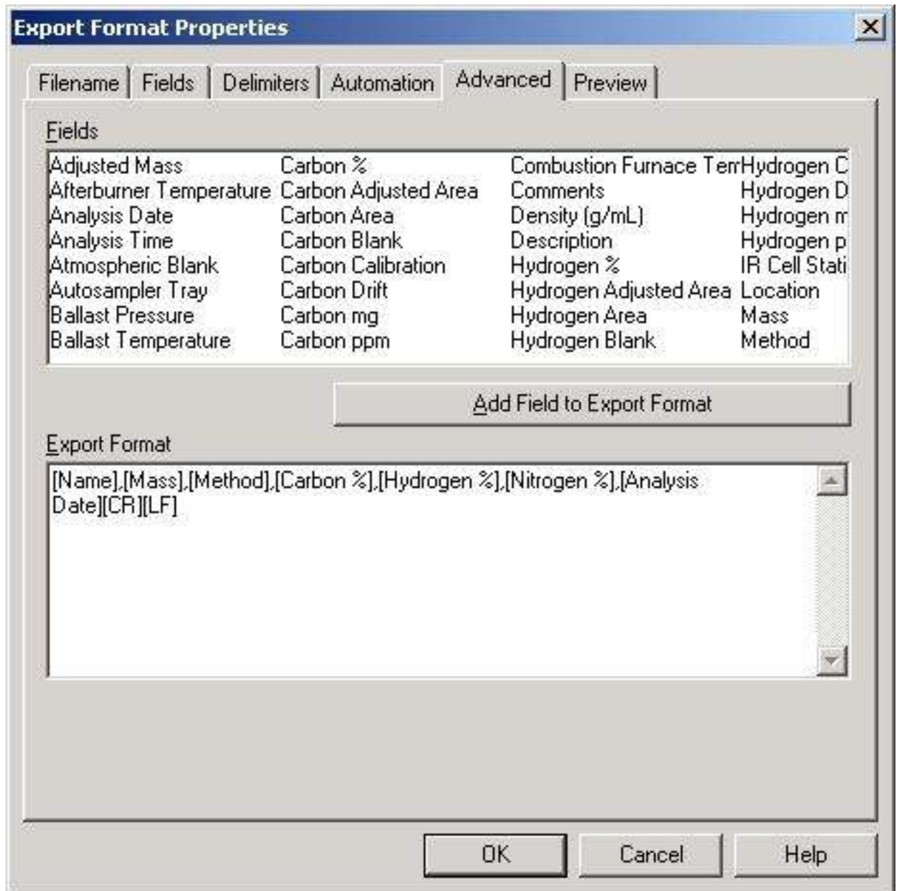
1. Select the Automation tab. The Automation screen will appear.



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.

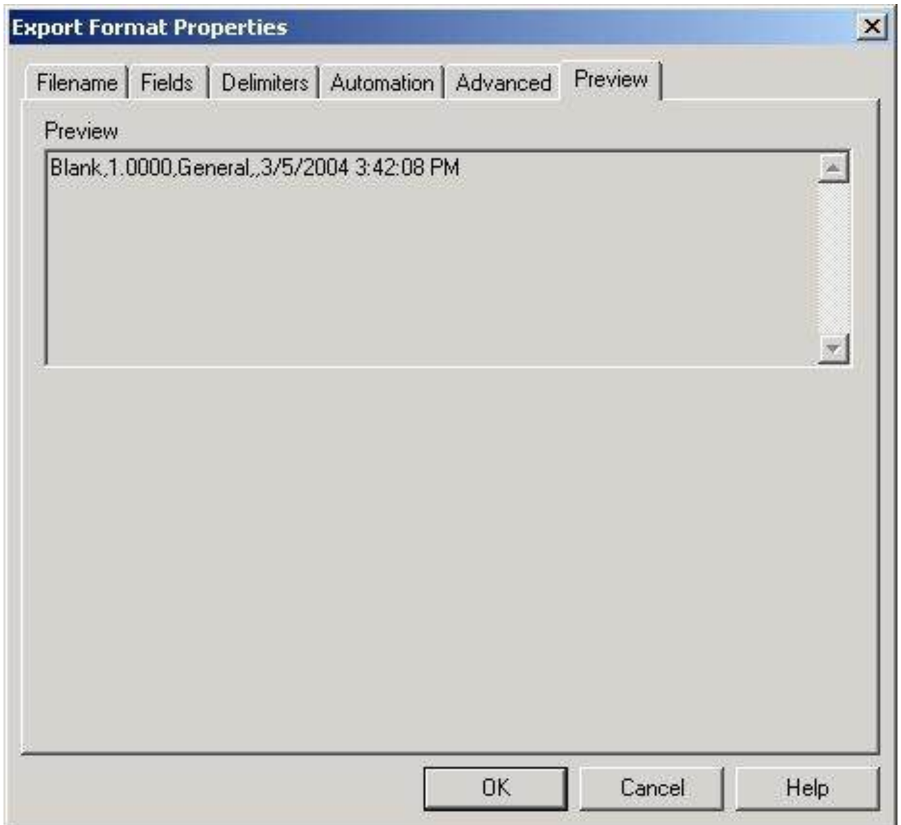


2. Position the cursor in the Export Format text box and use the mouse to place the cursor at the desired point in the format to add or delete a field.
3. Select a Field from the Fields box and select the Add Field to Export Format button to add a field.
4. Highlight a Field in the Export Format box and then press the Delete key 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 Export Format 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.

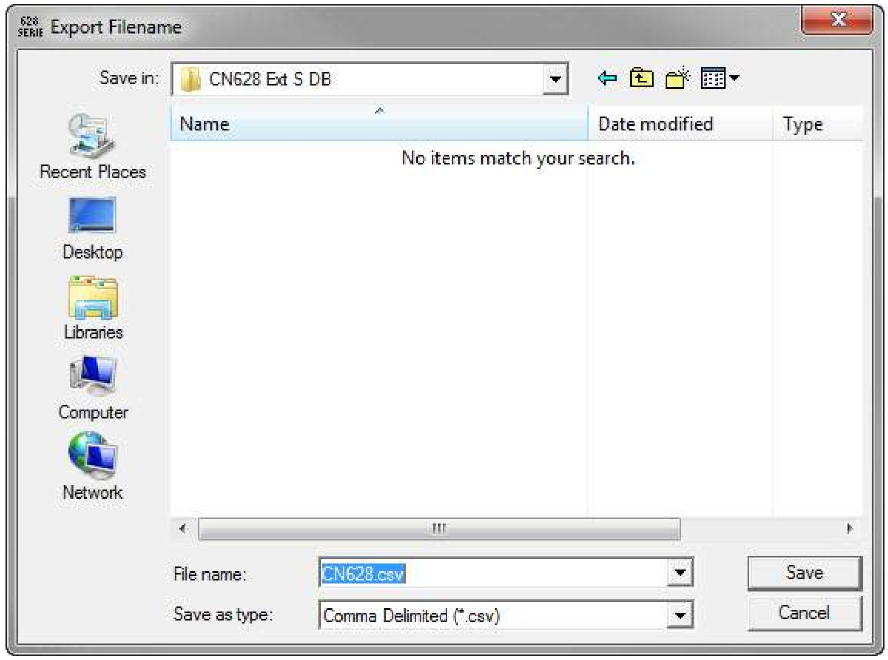
NOTE If no sample is selected, only the last sample in the spreadsheet will be exported and saved.

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 Tyoe drop-down box.

5. Select Save to export and save the file.

Export Text Buffers

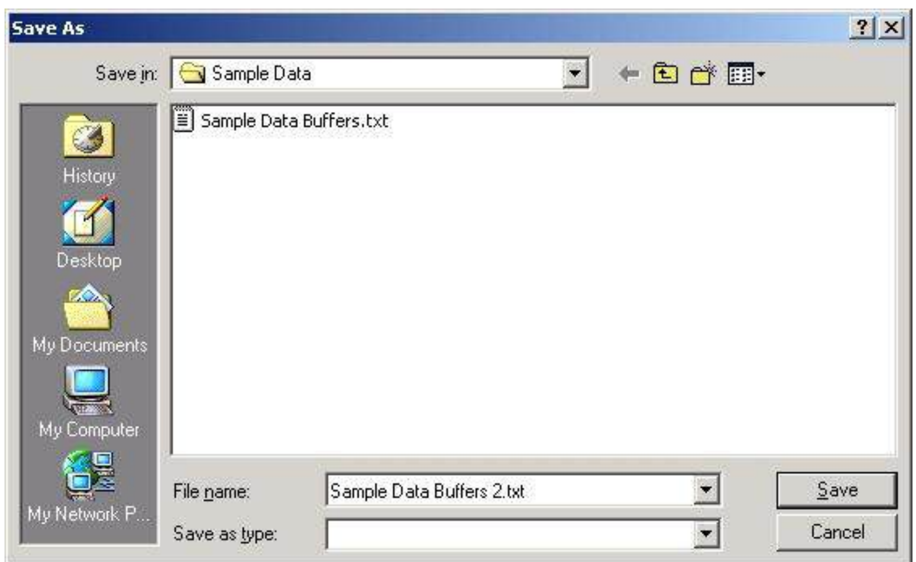
Text Export Buffers permits the operator to select sample plot data and export that data to a file. Sample plot data can be inserted into an *Excel* spreadsheet from the exported file.

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.



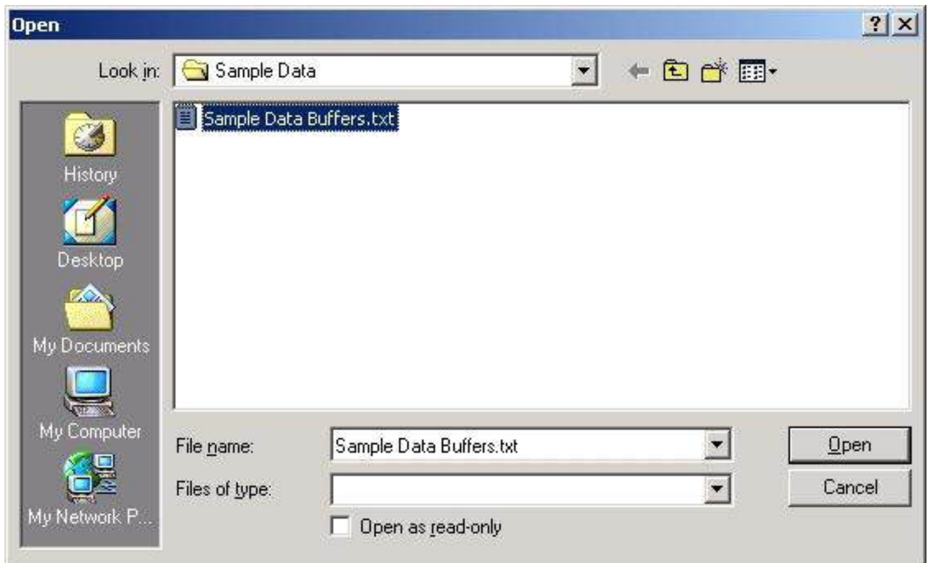
NOTE File extensions of (.txt) or (.csv) are good choices to insert the saved files into an *Excel* spreadsheet.

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 another application such as an *Excel* spreadsheet.

1. Select the Sample menu and select Text Import Data. The Open screen will appear.



2. Select the file to import.
3. Select Open to import the file.

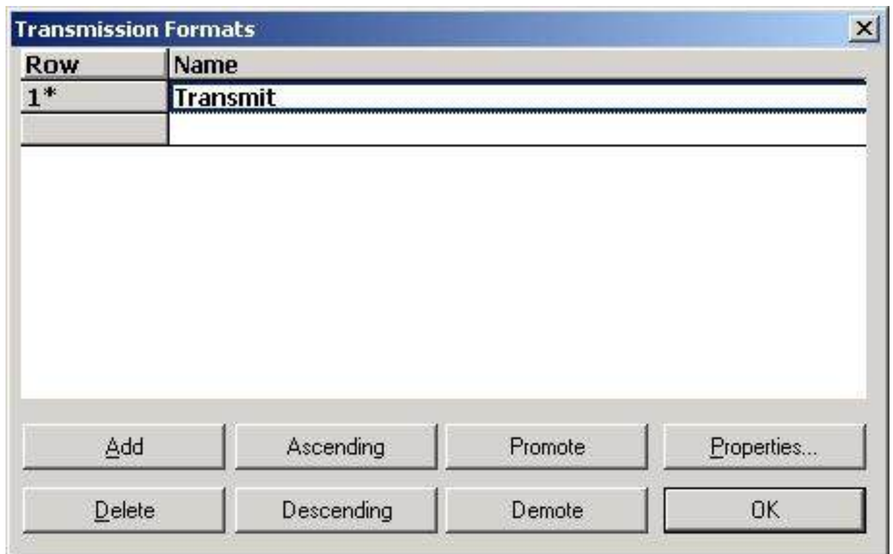
Transmitting Data

Before sample data can be transmitted to a peripheral device, a transmit format must be configured.

Multiple transmit formats can be configured.

Transmitting Format Configuration

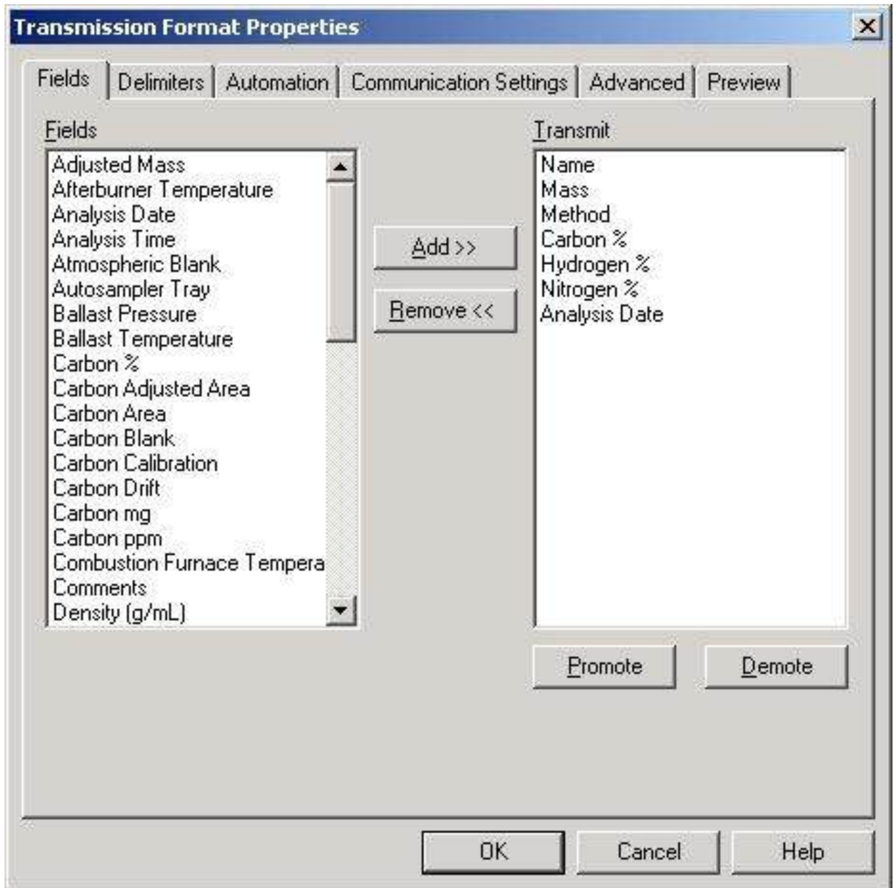
1. Select the Configuration menu and select Transmission Formats. The Transmission Formats screen will appear.



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 then select Promote.
4. To move the selected transmission format down toward the bottom of the list, select it and then 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

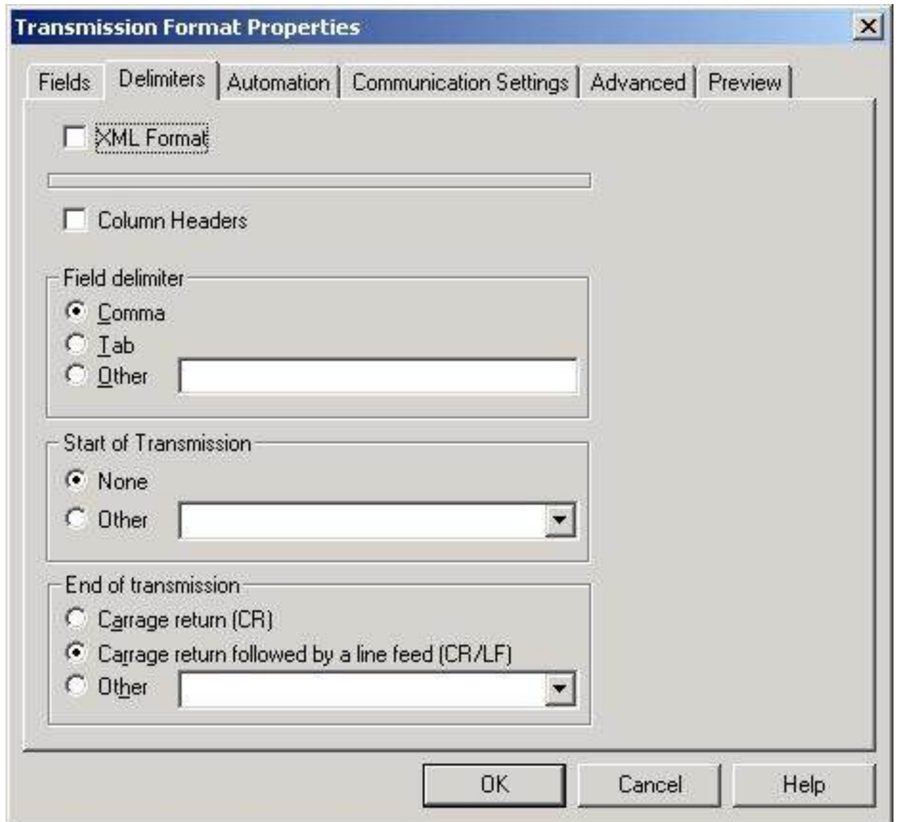
1. Select the transmission format from the Transmission Format screen and select Properties. The Transmission Format Properties screen will appear with the Fields tab selected.



2. To add a transmit field, select the field from the Fields box and select Add.
3. To remove a transmit field, select the field from the Transmit box and select Remove.
4. To move a field up toward the top of the list, select the field and then 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

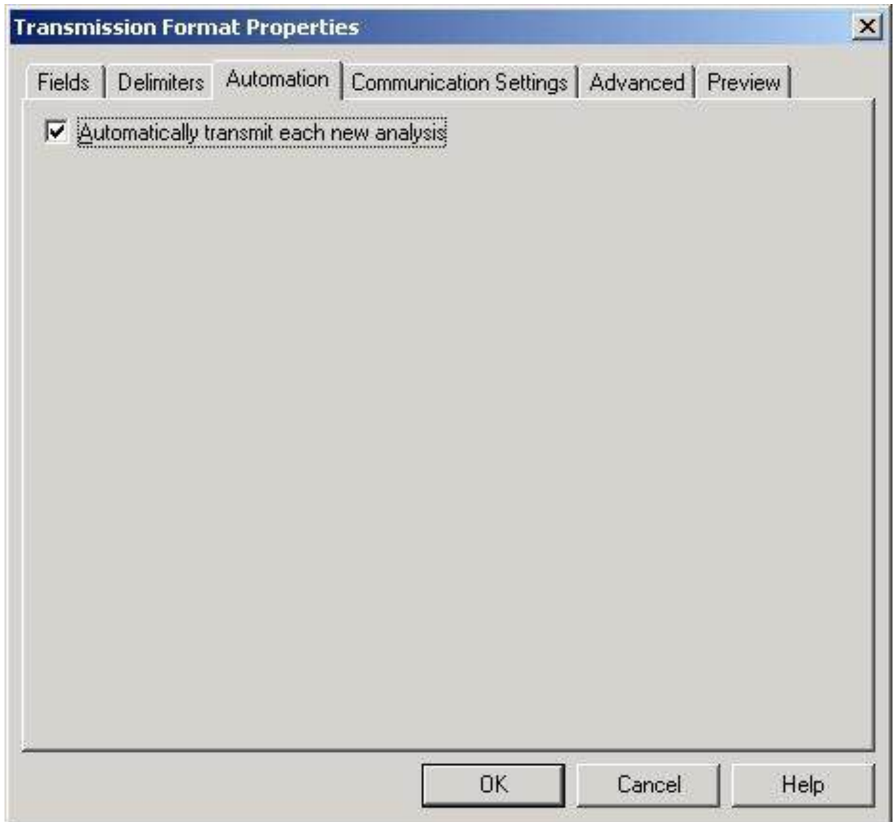
1. Select the Delimiters tab. The Delimiters screen will appear. Select the desired delimiters to export in the file.



2. Select the XML Format checkbox to export the text data in XML format. If XML Format is selected, no other parameters in the screen can be configured.
3. Select the Column Headers checkbox to transmit the column header.
4. Select or enter the Field Delimiter, Start of Transmission, and End of Line delimiter.
5. Select OK to save the changes and exit.
6. Select Cancel to exit this procedure without making changes.

Automation

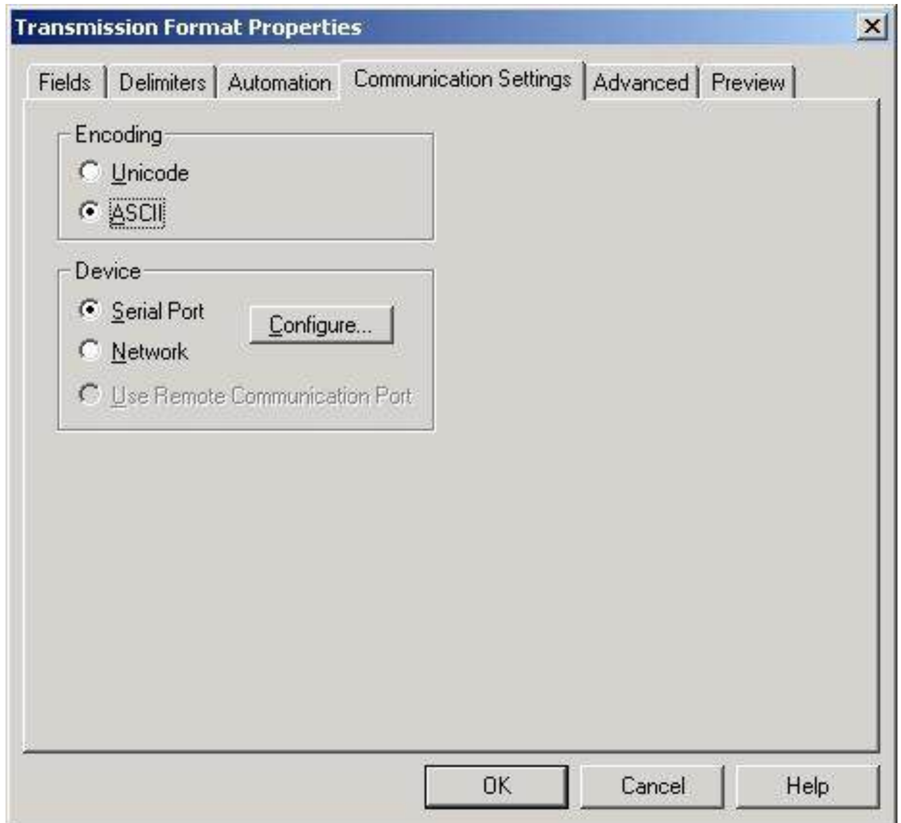
1. Select the Automation tab. The Automation screen will appear.



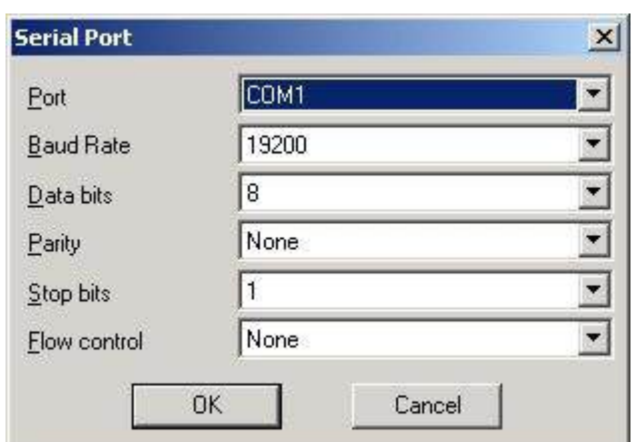
2. Select the Automatically Export Each New Analysis checkbox to automatically export the analysis data after every analysis.
3. Select OK to save the changes and exit.
4. Select Cancel to exit this procedure without making changes.

Communication Settings

1. Select the Communications Settings tab. The Communications Settings 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 dialog box 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: 7

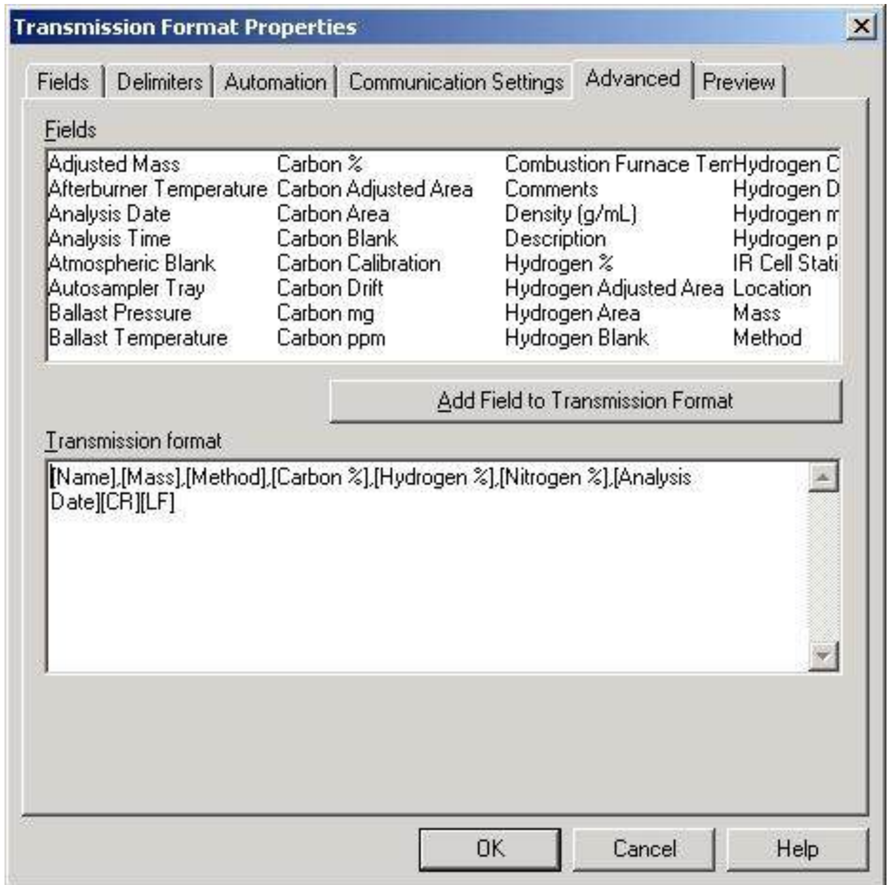
Parity—Sets the method of error checking used. Selections: Even, Odd, or None. Default: Even

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 Transmission Format and then press the Delete key on the keyboard to delete it.

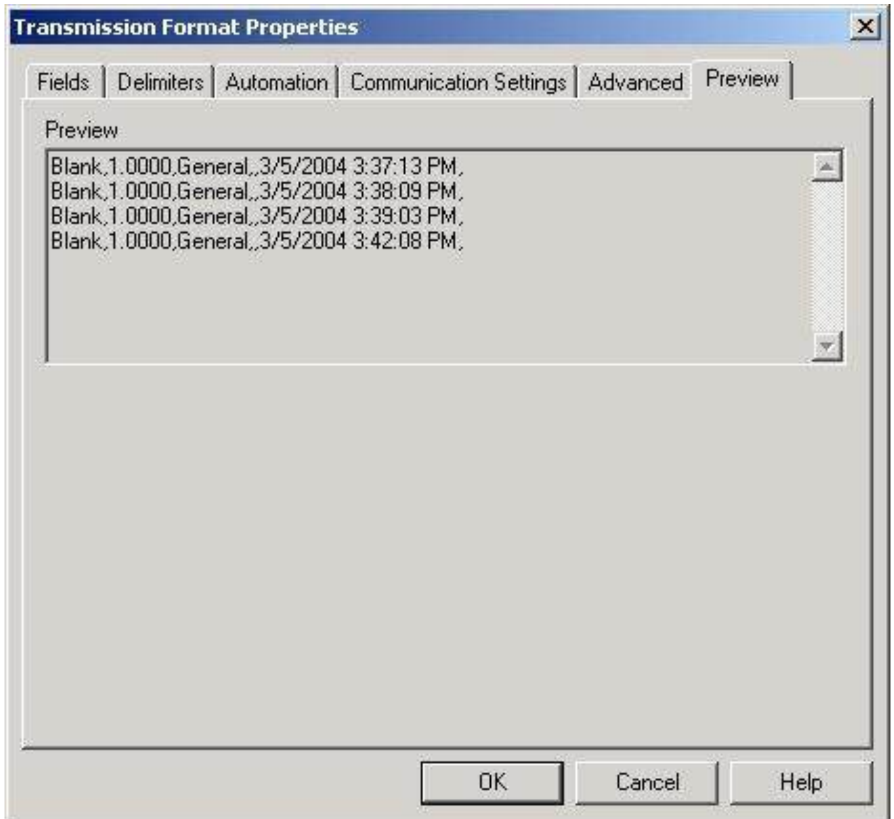
5. Select OK to save the changes and exit.

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 to save the changes and exit.
3. Select Cancel to exit this procedure without making changes.

Transmitting 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 Transmitting Format Configuration, page 5–63.

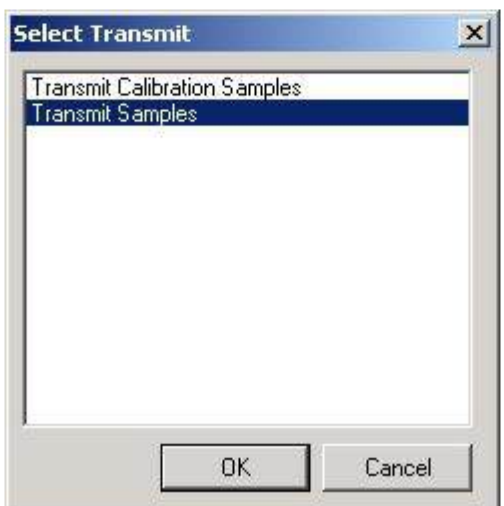
1. Click and drag the mouse pointer to select the rows with sample data to transmit.

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 Select Transmit screen will appear.

NOTE The Select Format 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

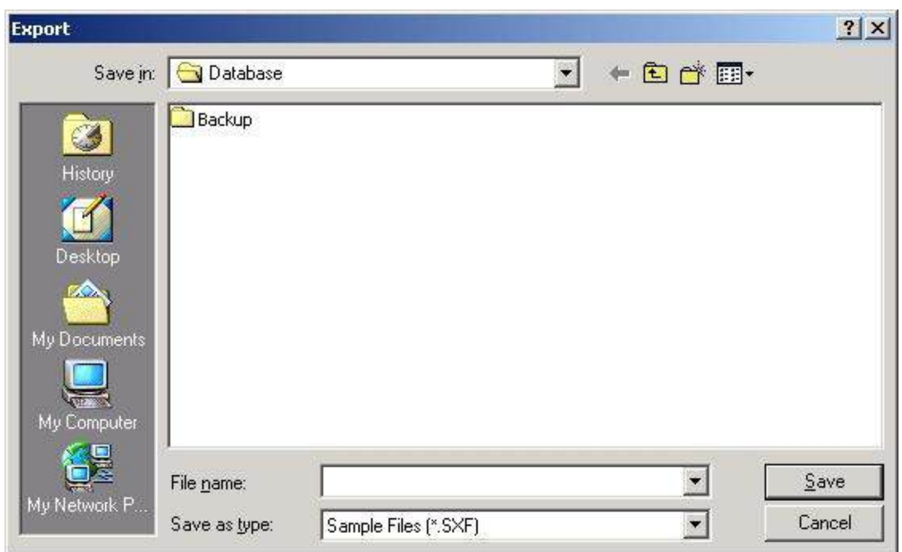
Data Backup permits the operator or manager to export sample data to a file. The file can be saved on the system's hard drive or transferred to another type of media for safe storage. If necessary, the file can be imported and the sample data restored. Refer to Transfer Import, page 5–74.

Transfer Export

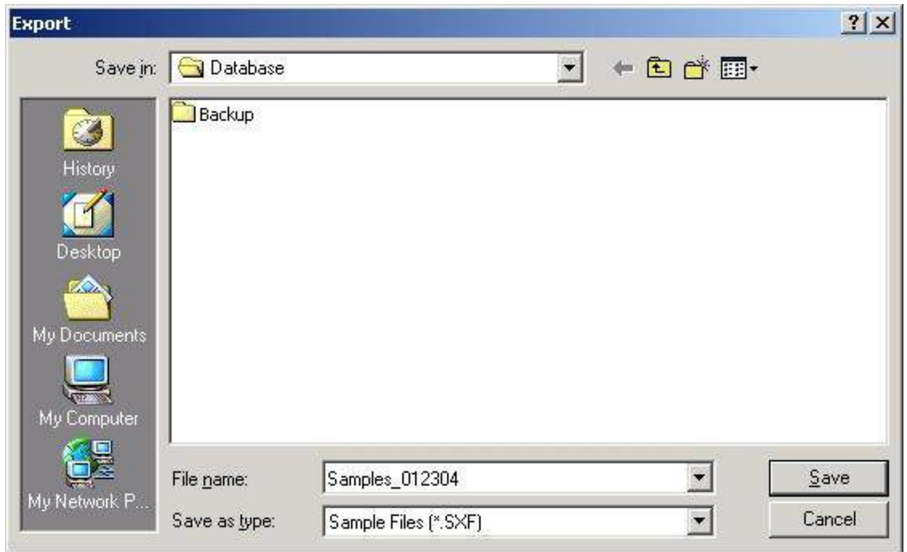
1. Select and drag the mouse pointer to select the rows with sample data to export to a file.

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.

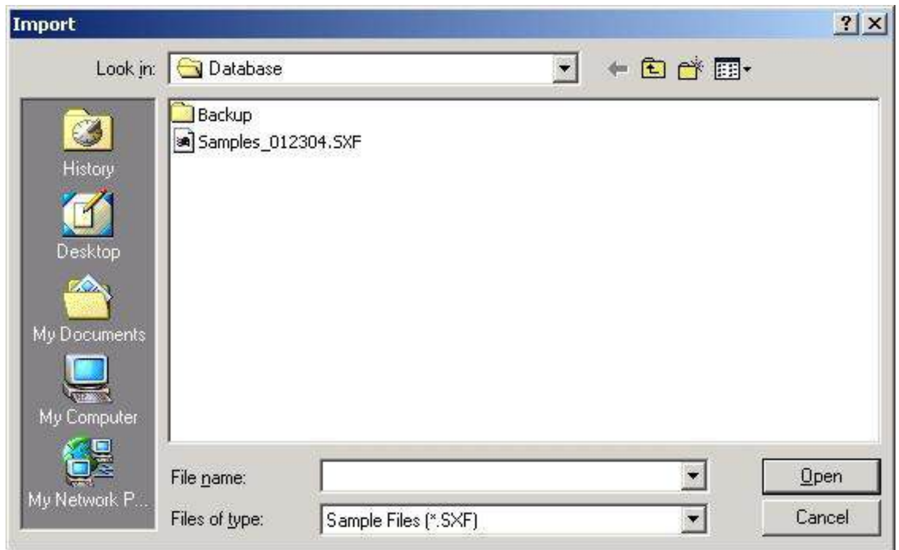


4. Select Save to export and save the sample data to a file.

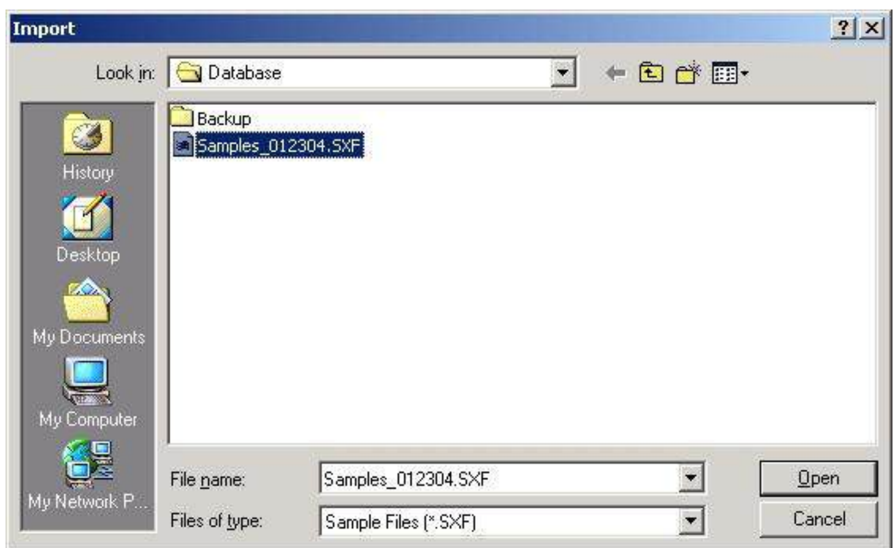
Transfer Import

Transfer Import restores sample data that was saved as a file by Transfer Export. Refer to Transfer Export, page 5–72.

1. Select the Sample menu and select Transfer Import. The Import File selection screen will appear.



2. Select the file to import by selecting on 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 5–75, for corrective action.

NOTE Please report any errors that are not defined in the following list 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\n standard'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.	Troubleshoot leak check for pressurization leak.
Failed Stabilization	Pressure did not stabilize after pressurizing for leak check.	Troubleshoot leak check for pressurization leak.
Leak Check early termination on step <step number>	Big leak.	Troubleshoot leak check for pressurization leak.
Leak (<step number>)	Leak in the indicated step.	Troubleshoot leak check for pressurization leak.
Overpressure (<step number>)	Overpressured in indicated step.	Troubleshoot leak check at 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 FP628 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 FP628, most likely due 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 On and the information in the registration box is correct. Contact LECO for a correct registration number.
Equipment number does not match.	Improper registration 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.

Message	Cause	Actions
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.\either the balance is configured incorrectly,\or 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.	Username 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>”.\n It 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.

Message	Cause	Actions
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 The method <method name> with default settings has been created\n and 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 that 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 nonexistent 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.
A communications error occurred while transmitting.	An undefined error occurred during data transmit.	Verify the port exists, is active, and not in use by other applications. If error persists, contact LECO.

External Sulfur Application Start

Message	Cause
The FP628 External Sulfur option is not registered. The software is closing. Sulfur was not listed as a registered option.	Contact LECO for registration with sulfur.

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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.

Illustrations

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.

CAUTION

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

Maintenance Item	Location of Maintenance Item	Inspection, Cleaning, and Maintenance Interval
Air Filter Cleaning	Inside left side panel of the instrument.	Vacuum daily and wash monthly to prevent clogging. Refer to Cleaning the Air Filter, page 6–7.
Aliquot Dosing Valve Cleaning	In ballast oven inside left hand side panel.	Clean monthly to prevent leak check failure. Refer to Cleaning the Aliquot Dosing Valve, page 6–8.
Ballast Tank Cleaning	In ballast oven inside left hand side panel.	Clean monthly or if the ballast leak check fails or soot or ash is visible. Refer to Cleaning the Ballast Tank, page 6–10.
Carousel Cleaning	On top of the loading head assembly.	The carousel should be cleaned weekly. Refer to Cleaning the Carousel, page 6–21.
Reduction Heater Tube Packing	Inside catalyst heater assembly. WARNING: Disconnect facility power and let catalyst heater cool before removing reduction heater tube.	Replace approximately every 750 analyses. Refer to Packing the Reduction Heater Tube, page 6–23.
Combustion Tube Packing	Inside furnace assembly. WARNING: Disconnect facility power and let furnace cool before removing combustion tube.	Replace if cracked or plugged, or approximately every 1500 analyses. Refer to Packing the Combustion Tube, page 6–33
Crucible Replacement	Inside combustion tube. Remove loading head and use tongs to remove crucible. WARNING: Furnace may be hot.	Refer to Replacing the Crucible, page 6–36.

Maintenance Item	Location of Maintenance Item	Inspection, Cleaning, and Maintenance Interval
Loading Head Cleaning	On top of the furnace shelf above the furnace assembly.	Inspect daily and clean ashes and soot if necessary. Refer to Cleaning the Loading Head, page 6–38.
Incoming TC Carrier Gas Scrubber, Repacking the Reagent Tube	Behind the access door on the front panel of instrument.	Replace every 90 days or when Anhydrone® cakes or LECOSORB® changes colors. Refer to Packing the Reagent Tube, page 6–43.
Aliquot Dose, Repacking the Reagent Tube	Behind the access door on the front panel of instrument.	Replace at counter limit (approximately 750). Refer to Packing the Reagent Tube, page 6–43.
O-rings	Located in various assemblies, reagent tubes, and loading head.	Inspect when repacking or replacing the reagent tubes, cleaning an assembly, or when damaged. Refer to O-rings, page 6–42.
Primary Furnace Filter Cleaning	Inside front door.	As necessary when visibly dirty.
Balston Filter	Inside front door.	As necessary when visibly dirty.
Ballast Tubing	Located in the ballast assembly. Refer to Figure 6-9, page 6–10.	In order to prevent leaks after maintenance, LECO recommends that the flexible tubing be replaced when the ballast is cleaned or when the tubing is removed from any fitting. Refer to Ballast Tubing, page 6–11.
Pinch Valve Tubing	Located in the ballast assembly. Refer to Figure 6-7, page 6–17.	The pinch valve tubing should be replaced every four months or sooner depending on use and application
Thermoelectric Cooler	Inside the right side panel of the instrument. Refer to Figure 6-29, page 6–51.	As necessary when visibly dirty.

Cleaning the Air Filter

NOTE: The air filter should be vacuumed daily and washed monthly to prevent clogging.

1. Locate the air filter inside the left side panel of the instrument.
2. Remove the air filter by removing the plastic housing.
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, verify 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 into the instrument.

Cleaning the Aliquot Dosing Valve

NOTE

The aliquot dosing valve should be cleaned monthly to remove dirt and other contaminants that may cause the valve to leak.

1. Permit the furnaces to cool and shut down the instrument. Refer to the Shutdown Procedure, page 5–14.
2. Disconnect the instrument from the facility AC power source.

WARNING

HIGH VOLTAGE HAZARD
This equipment operates from a 230V~ source. Contact with this voltage can be fatal. Disconnect the instrument from facility power before continuing with this procedure.

3. Remove the left side panel and locate the aliquot dosing valve.
4. Remove the dead-stop.
5. Press in on the retaining clip and remove the valve stem by grasping the knurled knob and pull it to the left. Refer to Figure 6-1, page 6–9.
6. Use a cotton swab or pipe cleaner to clean the valve block.
7. Inspect o-rings for damage and replace if necessary.
8. Wipe the valve stem and apply a thin coat of vacuum grease to the 10 o-rings.
9. Press in on the retaining clip and reinsert the valve stem into the top of the aliquot dosing valve, until valve stem locks into place.
10. Reinstall the dead-stop.
11. Reinstall the left side panel.
12. Reconnect the instrument to facility power.
13. Turn On the power switch.

Figure 6-1
Aliquot Dosing Valve

Cleaning the Ballast Tank

NOTE

If the ballast portion of the oxygen leak check fails repeatedly and no leaks are found in other areas, a dirty ballast tank could be the cause.

WARNING

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.

Ballast Assembly Removal

1. Select Diagnostics and toggle the Piston Return Solenoid SV12. The box should NOT be checked.
2. Disconnect the pneumatic tubing quick connect. Refer to Figure 6-3, page 6–13.
3. Disconnect the electrical cannon plug. Refer to Figure 6-3, page 6–13.
4. Loosen the ballast manifold thumbscrew and separate connection manifold. Refer to Figure 6-3, page 6–13.
5. Remove the stainless line from the flex tubing connection by pulling the stainless line up and out of the flex tubing connection. Refer to Figure 6-4, page 6–14.
6. Loosen nut at the end of the stainless line. Do not completely remove. Refer to Figure 6-4, page 6–14.
7. Rotate stainless line down so it is out of the way. Refer to Figure 6-5, page 6–15.
8. Remove the thumbscrew securing the top of the ballast assembly to the rear of the instrument. Refer to Figure 6-2, page 6–12.
9. Disconnect the pneumatic tubing connection at the top of the ballast assembly. Refer to Figure 6-2, page 6–12.
10. Lift the ballast and pinch valve assembly up and slide it out of the instrument.
11. Mark, identify, and disconnect the tubing and pinch valve electrical connections to the ballast assembly.
    A. Remove the thumbscrew securing the pinch valve assembly to the ballast.
    B. Disconnect the tubing and electrical connections at the base of the ballast assembly.
    C. Remove the pinch valve assembly from the ballast.

Ballast Cleaning

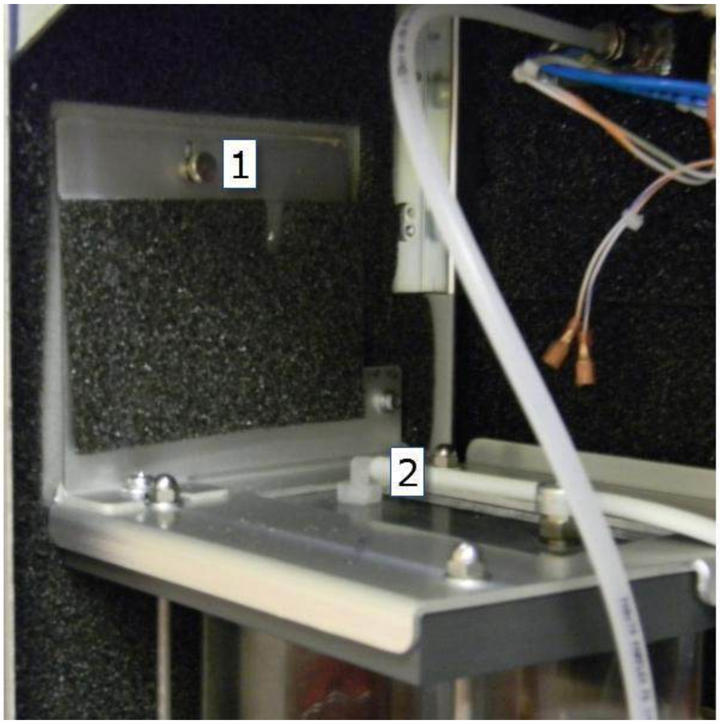
1. Remove the four nuts and four rods. Refer to Figure 6-8,page 6–19.
2. Remove the ballast top and ballast base and push the piston out of the ballast tank.
3. Remove, clean, and inspect the o-ring and replace the neoprene gaskets. Replace o-ring if there is any evidence of wear.
4. Wash the piston, ballast top, ballast tank, and ballast bottom with soapy water, rinse, and let dry.
5. Lightly grease the inside of the ballast tank. The piston should slide easily from end to end. Make sure the magnet in the piston is positioned toward the top of the ballast assembly.
6. Reinstall the ballast top and ballast base.
7. Inspect all the tubing connection to the ballast assembly. Replace any tubing that is cracked.
8. Reinstall the ballast assembly into the instrument. Reverse and use the procedure outlined in Ballast Assembly Removal, page 6–10.
9. Reconnect the instrument to the facility AC power source.
10. Turn the AC power switch to On.
11. Allow the instrument to warm up for one hour then perform the procedure outlined in Leak Check, page 8–19.

Ballast Tubing

Gas connections on the ballast and pinch valve assemblies are made with flexible tubing. This tubing is pushed onto barb fitting and metal tubing to form a gas tight seal. Refer to Figure 6-2, page 6–12; Figure 6-3, page 6–13; and Figure 6-8, page 6–19.

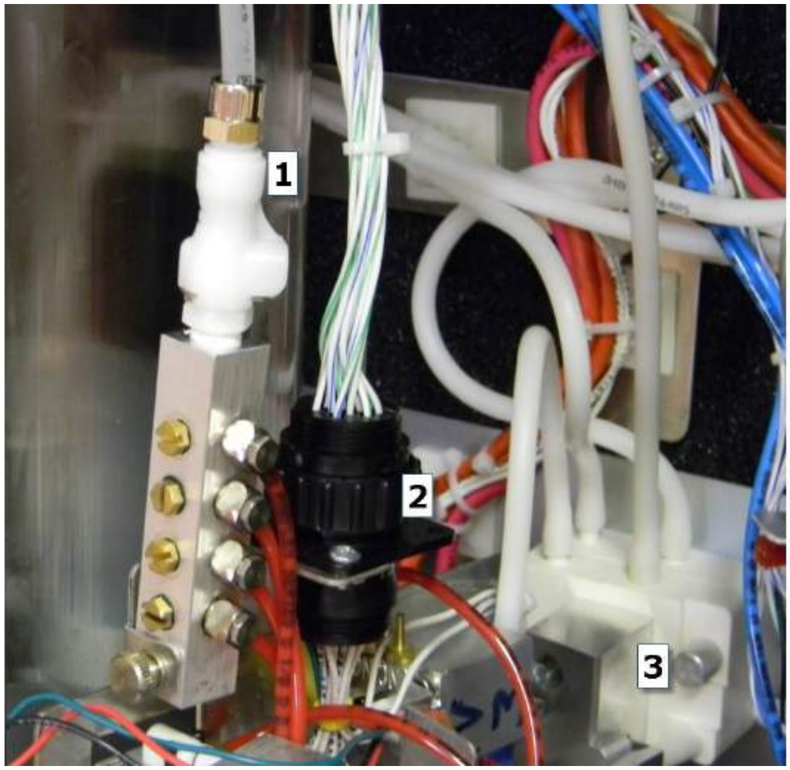
In order to prevent leaks after maintenance, LECO recommends that the flexible tubing be replaced when the ballast is cleaned or when the tubing is removed from any fitting.

Ballast Tubing Assembly is LECO part number 625-602-470 and is provided in the component pack.



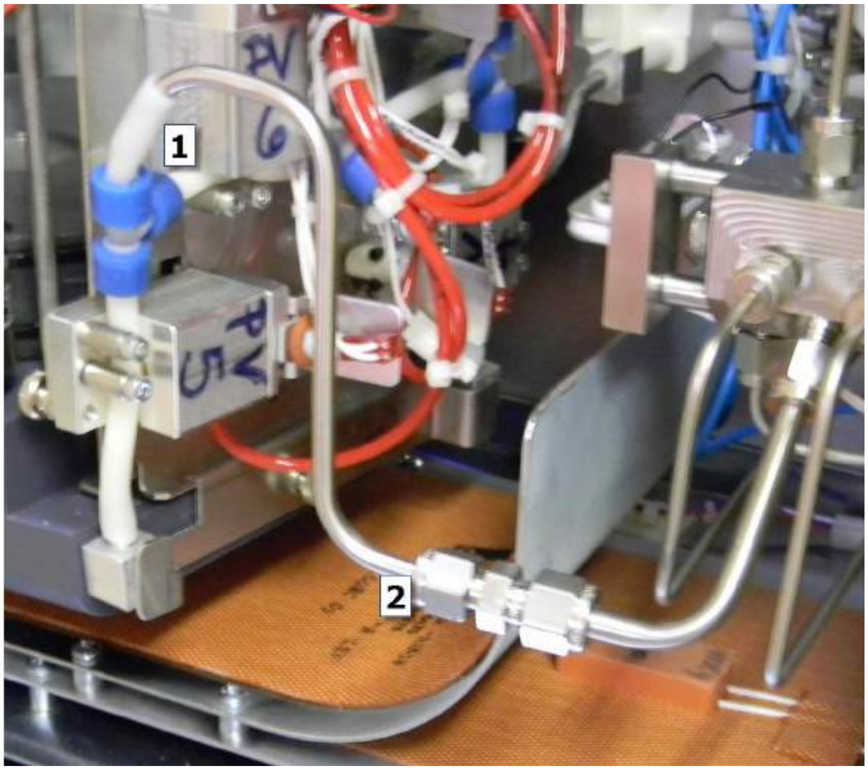
Number	Description
1	Thumbscrew
2	Pneumatic Tubing

Figure 6-2
Ballast Top Assembly



Number	Description
1	Pneumatic Tubing Quick Connect
2	Electrical Cannon Plug
3	Ballast Manifold Thumbscrew

Figure 6-3
Ballast Connections



Number	Description
1	C-Flex Tubing to Doser
2	Stainless Line from Ballast to Doser

Figure 6-4
C-Flex Tubing Connection

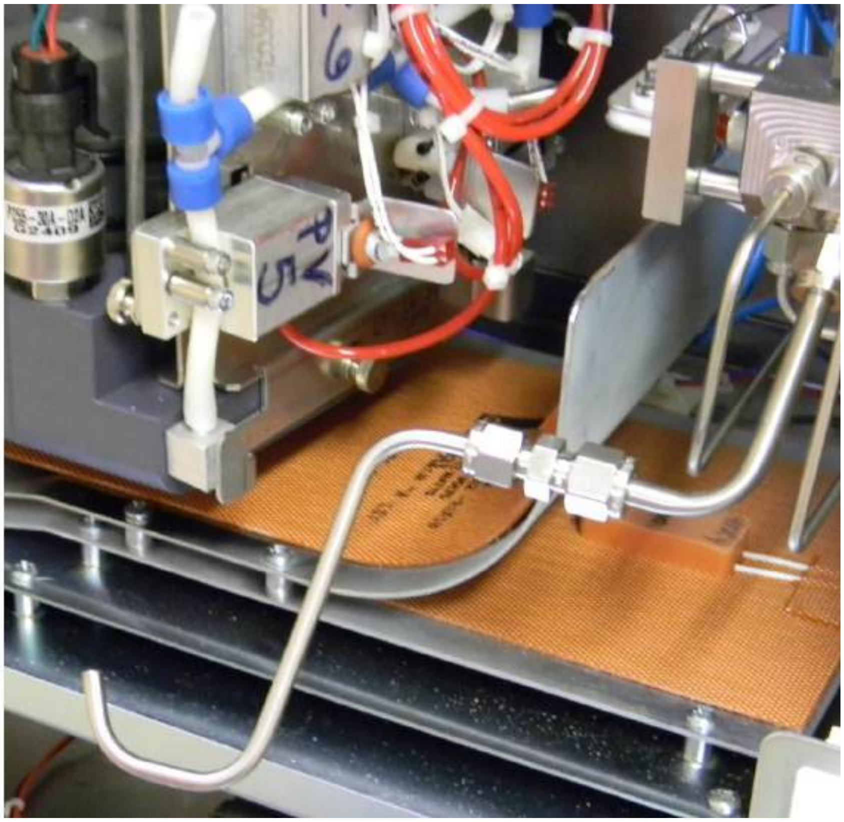


Figure 6-5
Stainless Line from Ballast to Doser Disconnected

Replacing the Pinch Valve Tubing

The pinch valve tubing should be replaced every four months or sooner depending on use and application.

Turn Off the AC power to replace the tubing.

1. Turn Off the oxygen and pneumatic gas supplies. Refer to Hide/Show the Toolbar, page 4–32.
2. Refer to Ballast Assembly Removal, page 6–10, and remove the ballast assembly.
3. Position the ballast assembly so that the pinch valves are accessible.

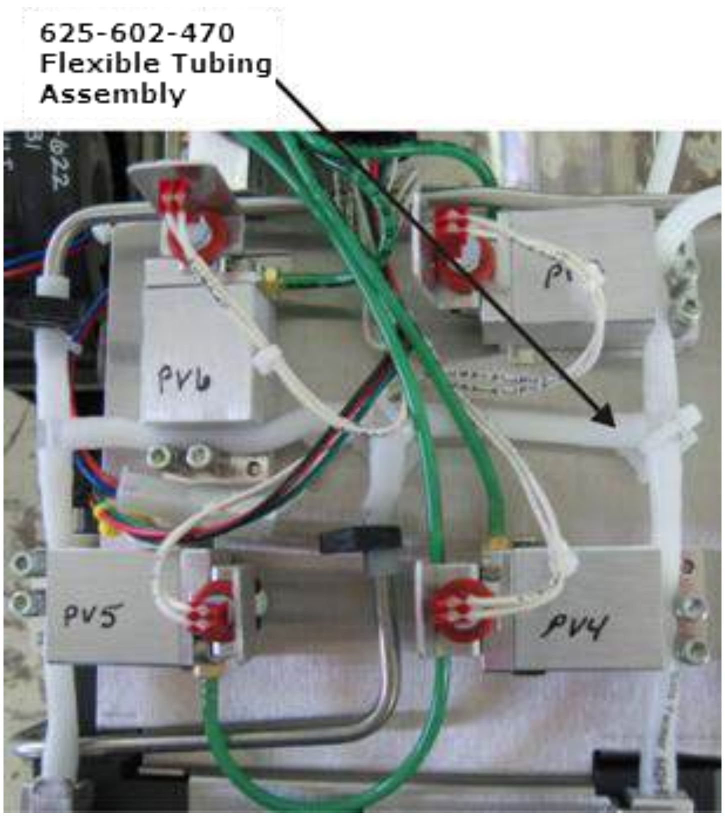


Figure 6-6
Ballast Pinch Valve Assembly

4. Replace the white flexible tubing with the 625-602-470 Replacement Tubing Assembly by removing the old tubing and installing the new tubing. Position the tubing as shown in Figure 6-9, page 6–21. Make sure the white flexible tubing is pushed completely into the connection points on the pinch valves.

NOTE For proper operation, the white flex tubing running through the pinch valves must be routed straight as it enters and exits each pinch valve. Minor trimming of the length of some tubing may be required.

5. Reinstall the ballast assembly.

6. Turn On the gas supplies.

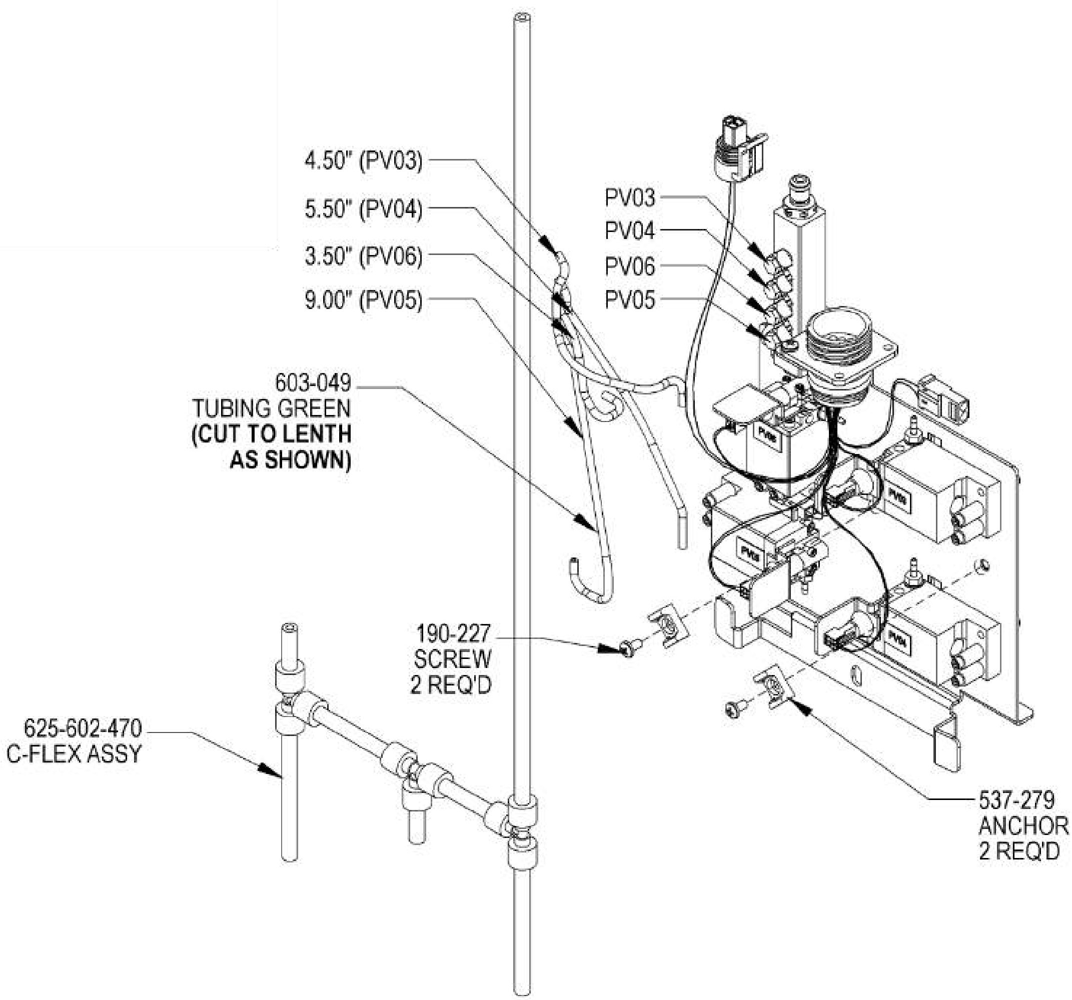


Figure 6-7
Pinch Valve Tubing

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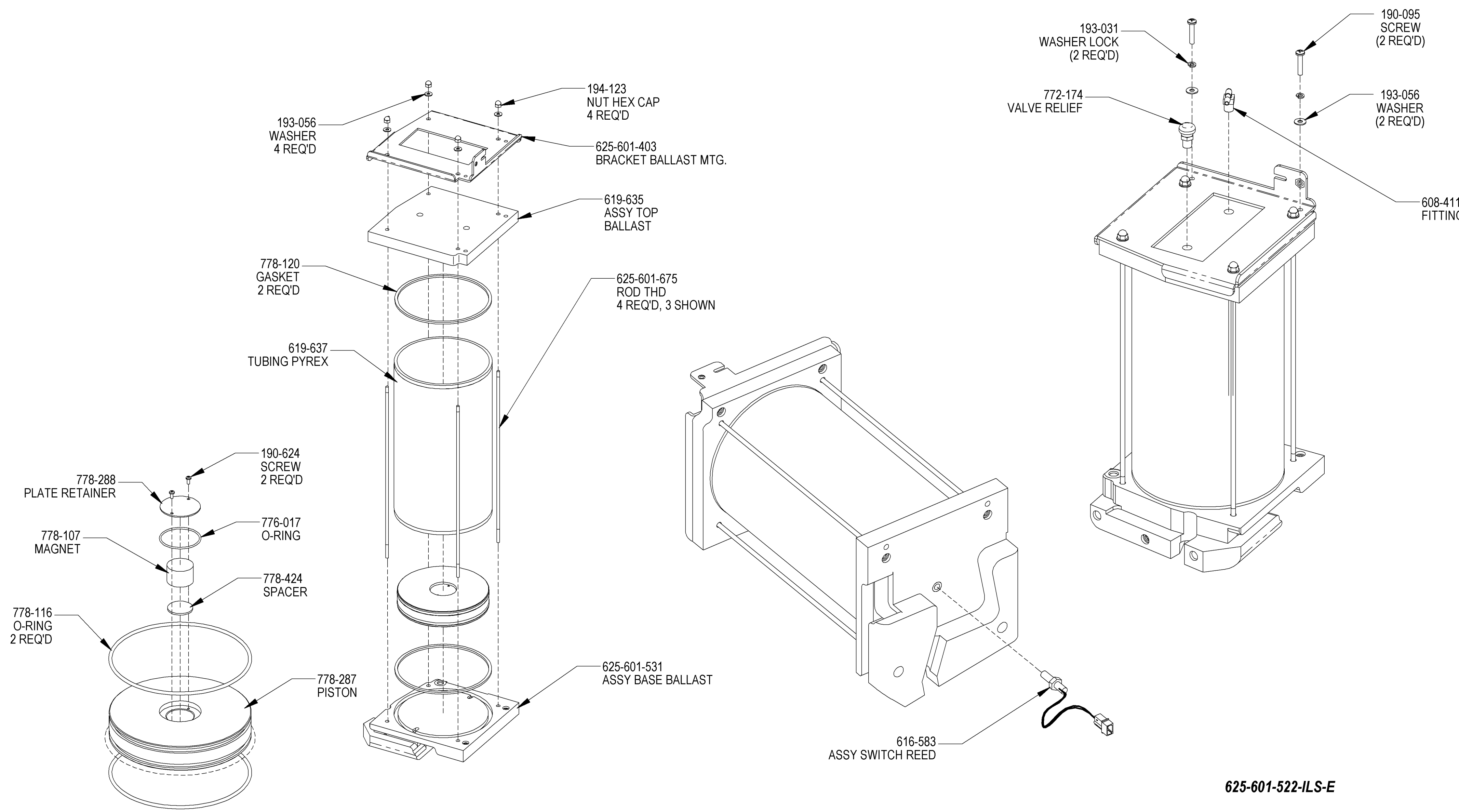

Figure 6-8
Ballast Disassembly

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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 6-10, page 6–22.
5. Reinstall the metal plate.

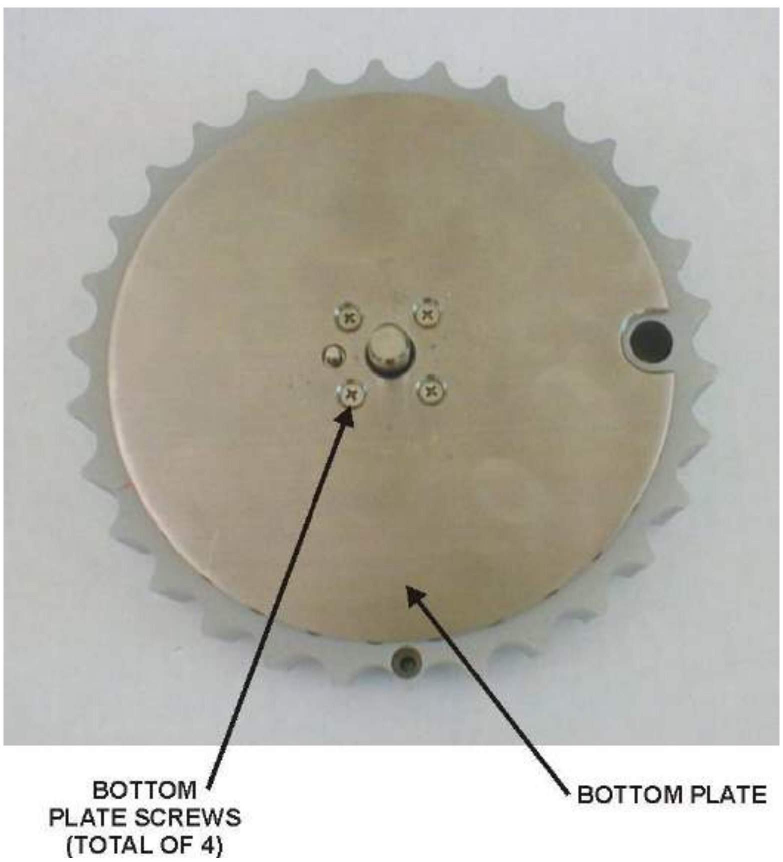


Figure 6-9
Carousel Bottom View

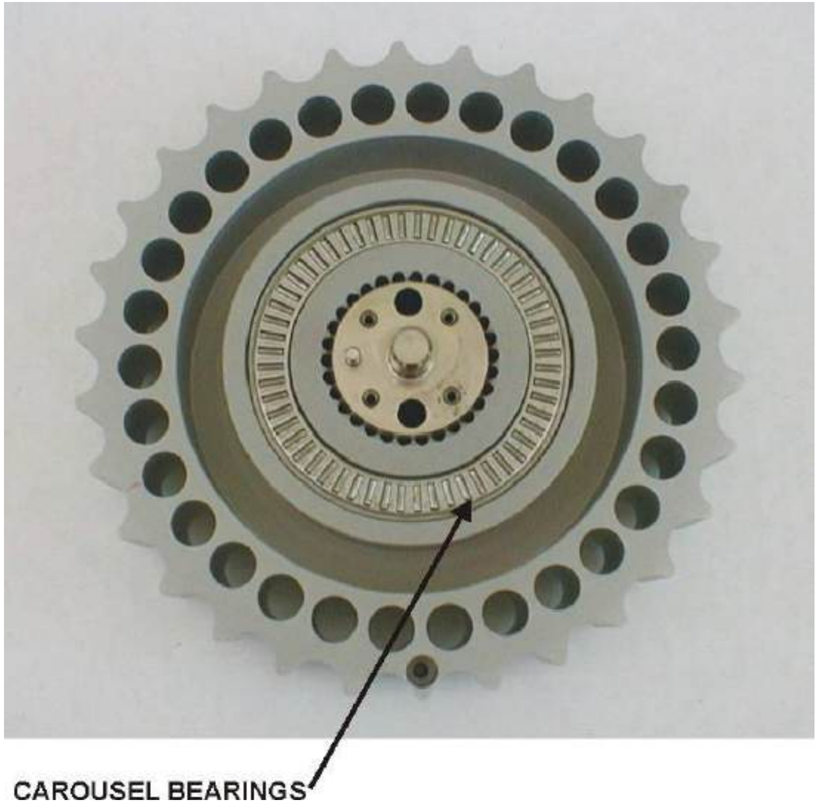


Figure 6-10
Carousel Bearings

Packing the Reduction Heater Tube

NOTE

The reduction reagent materials should be replaced approximately every 750 analyses if pure helium or argon (99.99% or better) is used. If the TC carrier gas 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 6-11, page 6–25.
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 6-12, page 6–26.
    A. Pack 1 inch of copper turnings into the bottom of the reduction heater tube.
    B. Pack $1^{3}/_{4}$-inches of N-catalyst on top of the copper turnings. It is only necessary to replace the N-catalyst every second repacking.
    C. Pour $^{1}/_{4}$-inch of copper turnings onto the N-catalyst. Compress the turnings.

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. Make sure 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 Standby and wait 30 seconds 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. Refer to Resetting Maintenance Counters, page 6–59.
19. Run several Blanks Analyses before beginning sample analysis.

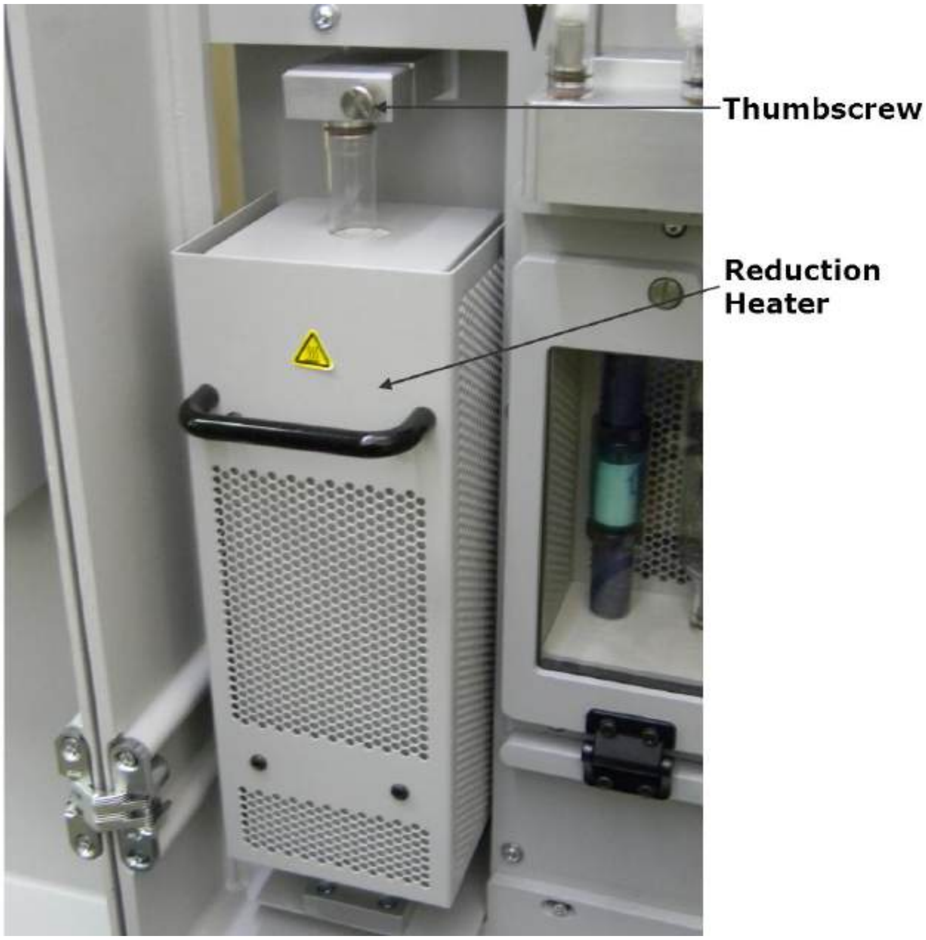


Figure 6-11
Reduction Heater

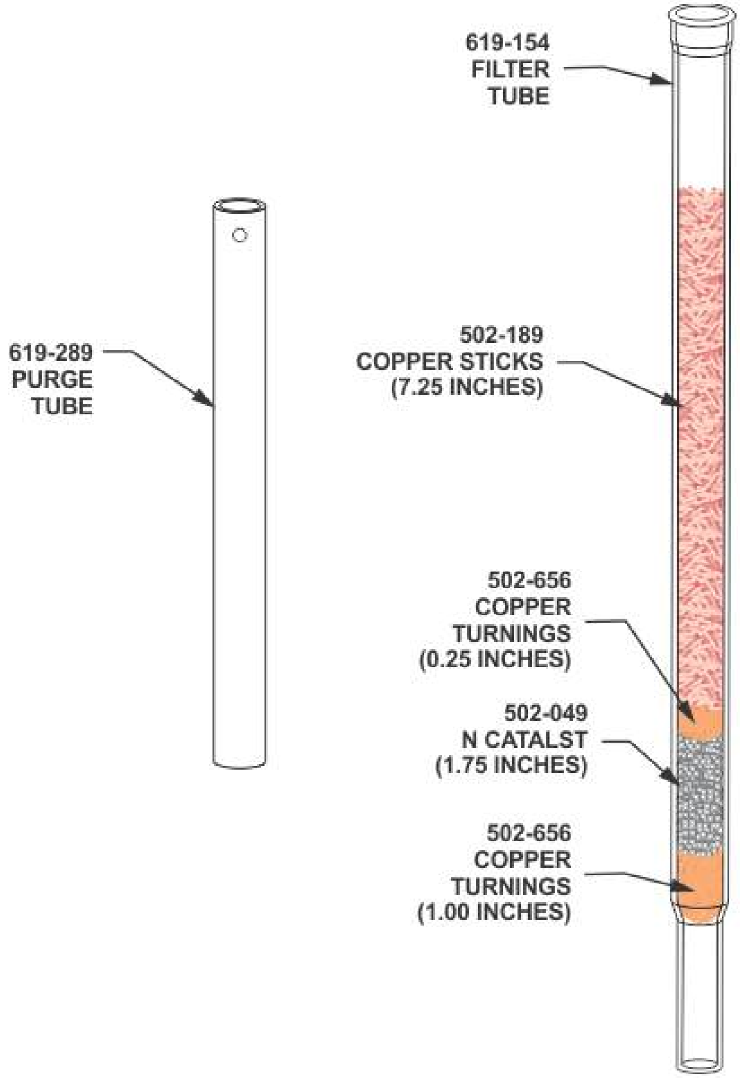


Figure 6-12
Packing the Reduction Heater Tube

Removing and Replacing the Combustion Tube

1. Refer to the Shutdown Procedure, page 5–14, 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 the procedure outlined in Replacing the Crucible, page 6–36, and remove the loading head.
4. Remove the furnace top shelf.
5. Refer to the procedure outlined in Replacing the Crucible, page 6–36, 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 6-13, page 6–29.
8. Remove the afterburner cap. Refer to Figure 6-13, page 6–29.
9. Remove the four screws in the afterburner interface block and remove the block. Refer to Figure 6-14, page 6–29.
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 6-15, page 6–30.
11. Remove the two screws securing the furnace bottom assembly and remove the bottom assembly. Refer to Figure 6-16, page 6–31. 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 procedure outlined in Packing the Combustion Tube, page 6–33, and repack the combustion tube.

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.

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.

CAUTION

COMBUSTION TUBE HEIGHT ADJUTMENT
Only perform the next steps to adjust the height of the combustion tube. If the combustion tube height is correct skip to step 17.C.

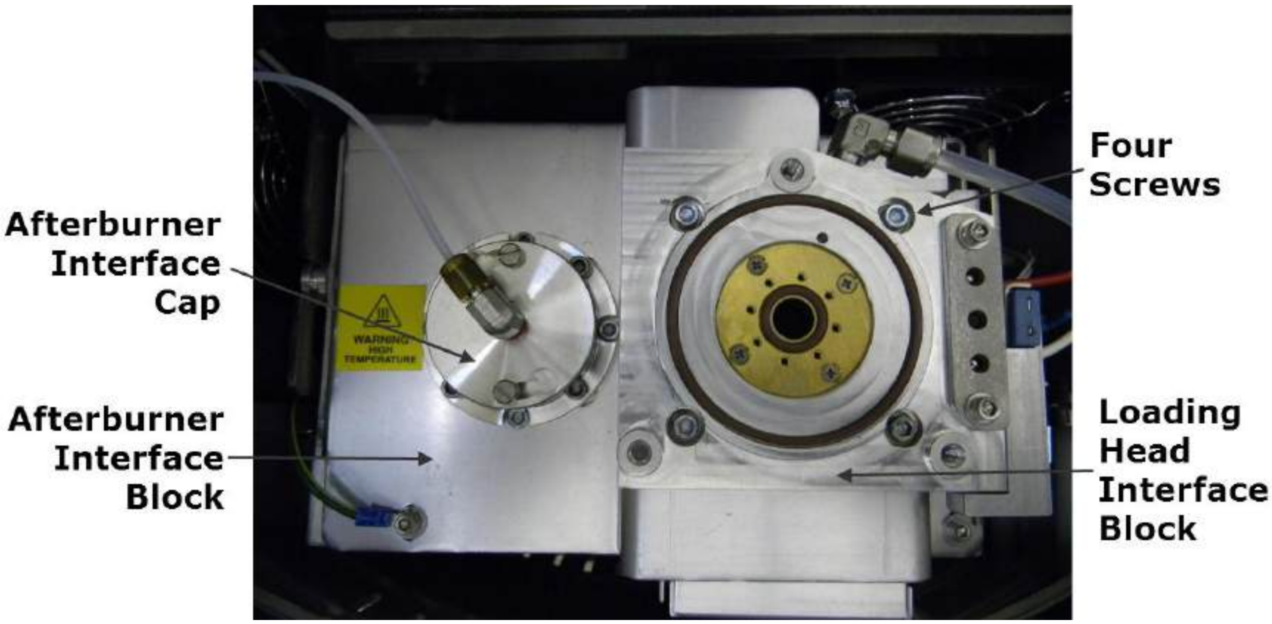
16. Loosen the combustion tube stop on the bottom of the furnace assembly. Refer to Figure 6-16, page 6–31.
17. Install the furnace bottom assembly.

NOTE

Make sure the tabs on bottom of the furnace are overlapped as shown in Figure 6-16, page 6–31.

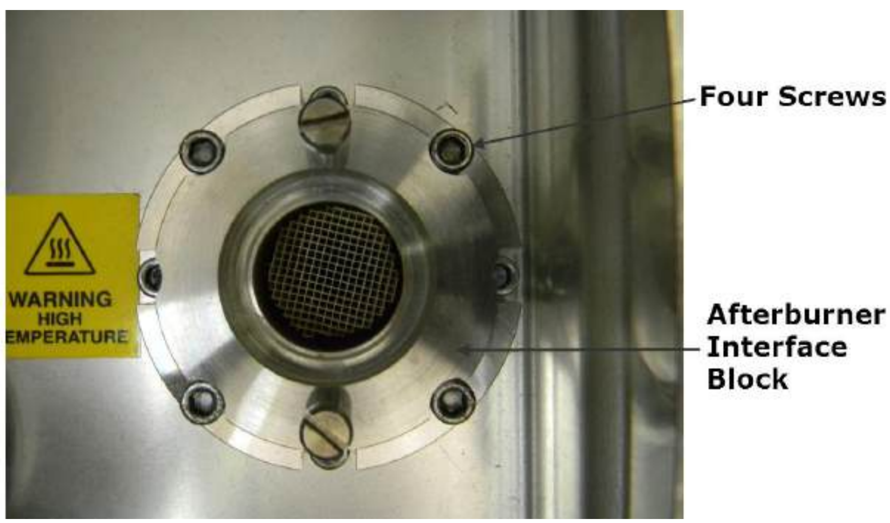
   A. Raise the combustion tube stop until resistance is met.
   B. Tighten the combustion tube stop screw.
   C. Reinstall the afterburner interface block using the four screws that were removed from the block. Refer to Figure 6-14, page 6–29.
   D. Clean the secondary wire screen filter in the afterburner interface cap with a brush. Refer to Figure 6-17, page 6–32.

18. Reinstall the afterburner cap. Refer to Figure 6-13, page 6–29.
19. Reinstall the combustion block, crucible, and lance.
20. Reinstall the combustion tube furnace.
21. Replace loading head.



NOTE Use a small amount of 773-942 Anti-seize Compound on each of the four loading head interface block screws.

Figure 6-13
Furnace Interface Blocks



NOTE Use a small amount of 773-942 Anti-seize Compound on each of the four afterburner interface block screws when reinstalling the loading head block.

Figure 6-14
Afterburner Interface Block

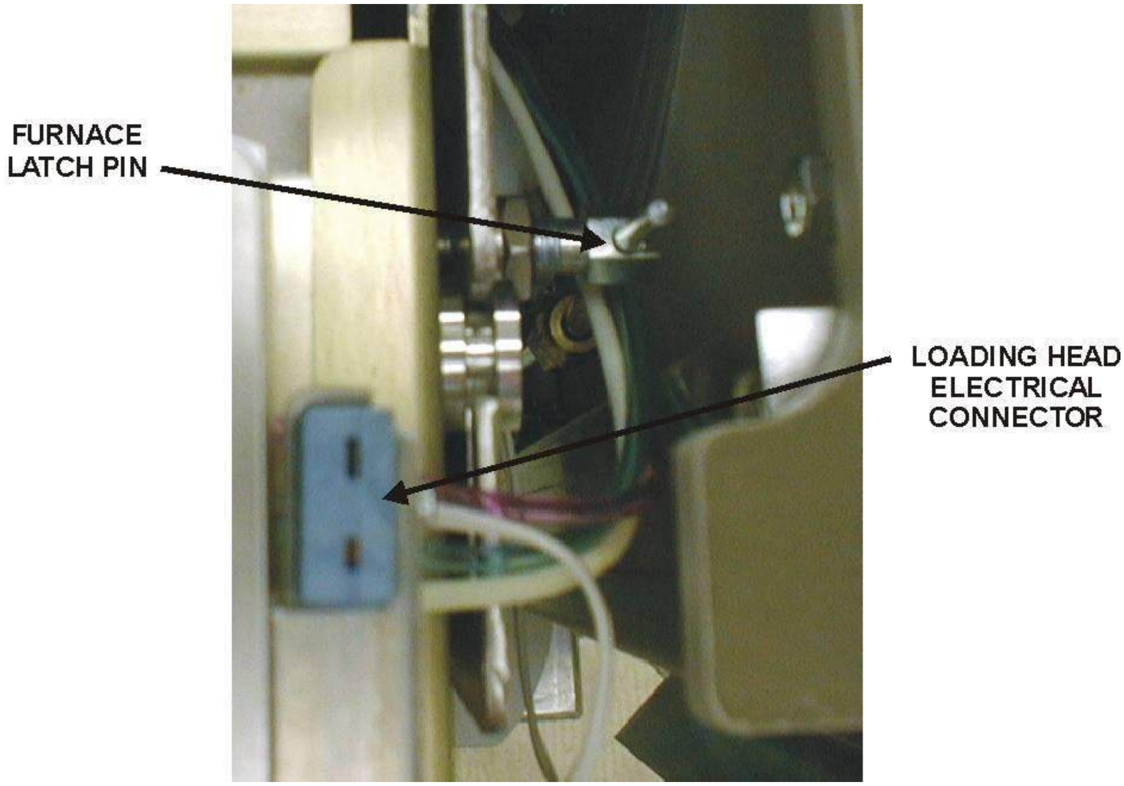
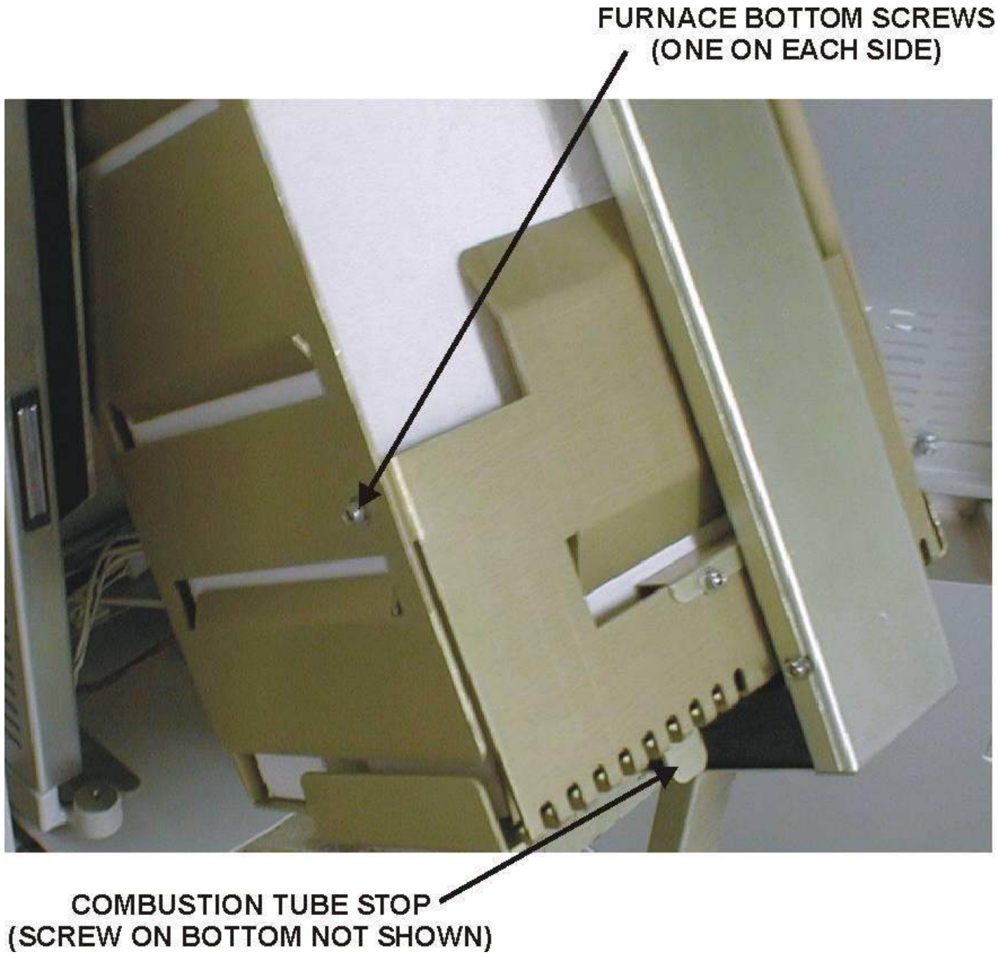


Figure 6-15
Furnace Latch Pin



NOTE When reassembling the furnace, verify tabs overlap as shown.

Figure 6-16
Combustion Furnace Assembly

Figure 6-17
Secondary Wire Screen Filter

Packing the Combustion Tube

Replace the combustion tube if it becomes cracked or plugged or about every 1500 analyses. The combustion tube can be reused even if it looks cloudy.

The furnace reagents should be dried at 105°C for two hours before packing the combustion tube.

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 $^{3}/_{4}$-inch wide.
2. Using the quartz wool extractor, push three rolled quartz wool strips into the longer end of the combustion tube until the rolls are properly positioned in the combustion tube. Refer to Figure 6-19, page 6–35.
3. Using the quartz wool extractor, push three quartz wool rolls into the shorter end of the combustion tube until the rolls are properly positioned in the combustion tube.
4. Pour 30 cc of 501-609-HAZ Furnace Reagent into the shorter end of the combustion tube on top of the quartz wool.
5. Add three quartz wool strips into the shorter end. Be careful to match the outside diameter of the roll to the inside diameter of the combustion tube. Each section is $^{3}/_{4}$-inch wide.
6. Insert a honeycomb ceramic plug into the short end of the combustion tube until it rests on the quartz wool.
7. Insert the combustion tube into the furnace using the two high-temperature orange o-rings.
8. In the longer end of the combustion tube, insert the crucible until it rests on the quartz wool.

9. Using the crucible extraction tool. Measure the distance between the top of the crucible and the top of the lance as it would be positioned.

10. Add or remove a small amount of quartz under the crucible to ensure that the bottom of the lance will rest $^{1}/_{4}$ inch inside the top of the crucible.

11. Insert the lance assembly into the longer section of the combustion tube.

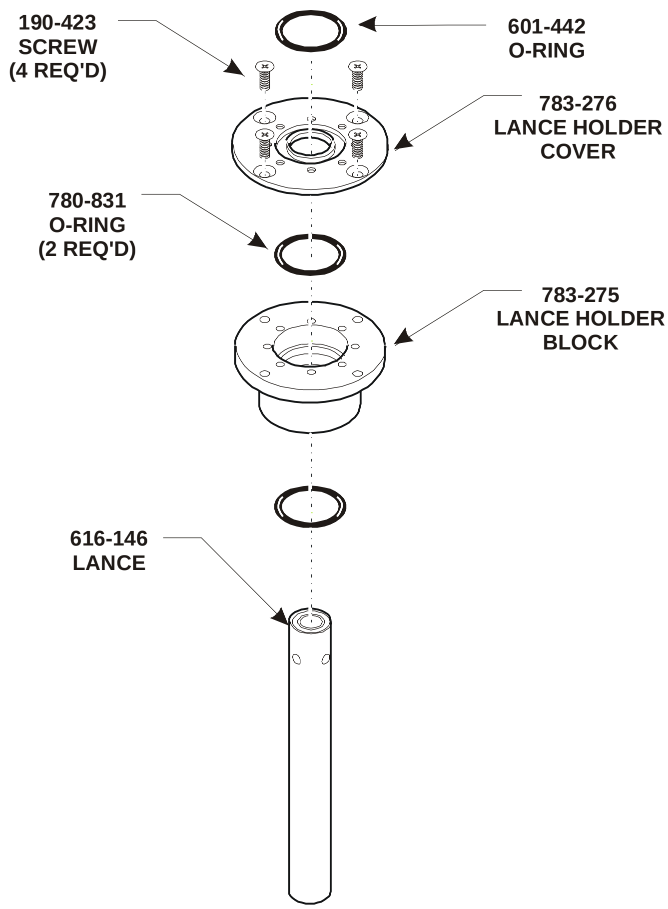


Figure 6-18
Lance Assembly

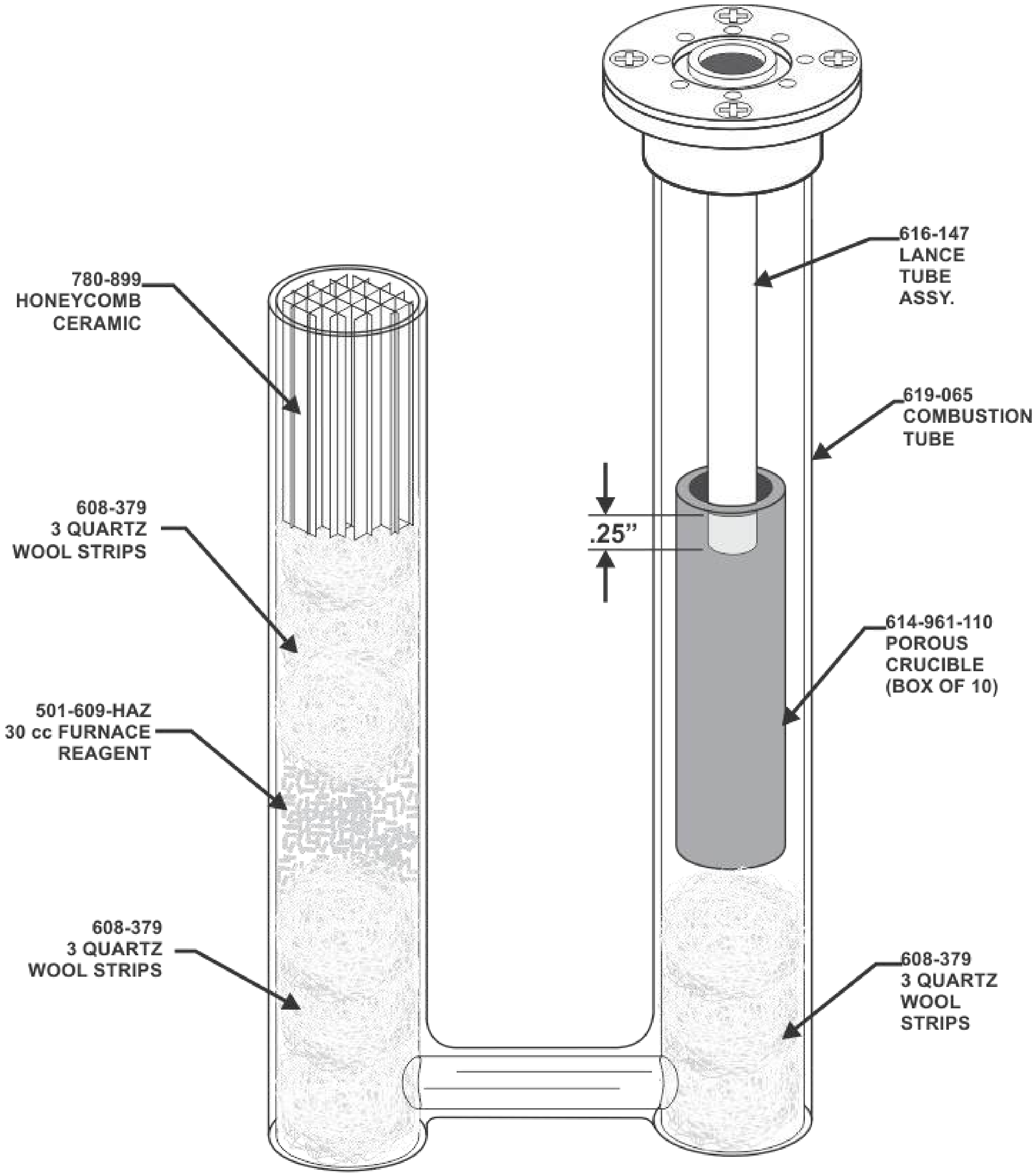


Figure 6-19
Combustion Tube Packing

Replacing the Crucible

WARNING

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.

NOTE

If the furnace is not cooled to room temperature before replacing the crucible, the furnace will stop and need to be restarted.

1. Remove the three screws securing the loading head to the furnace. Refer to Figure 6-21, page 6–37.

CAUTION

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. Screw the lance extractor tool into the small hole on the lance head and remove the lance. Refer to Figure 6-22, page 6–37.
4. Place the lance and extractor tool inside the front door.
5. Using the crucible extractor tool, reach into the combustion tube and grasp the crucible. Lift the crucible out and discard when cool.
6. Using the crucible extractor tool, place a new crucible in the combustion tube and replace the lance and loading head.

CAUTION

To prevent damage to the loading head, properly align the electrical connectors before pushing the loading head onto the instrument.

7. In the Diagnostics/Furnace dialog box, in the Combustion Furnace section, select Restart to restart the furnace.
8. Allow the crucible to reach operating temperature.
9. Reset the crucible counter by accessing Resetting Maintenance Counters, page 6–59.
10. Run two blank analyses to purge air and moisture from the system.

NOTE

The crucible must be replaced more frequently when running samples with high ash content.

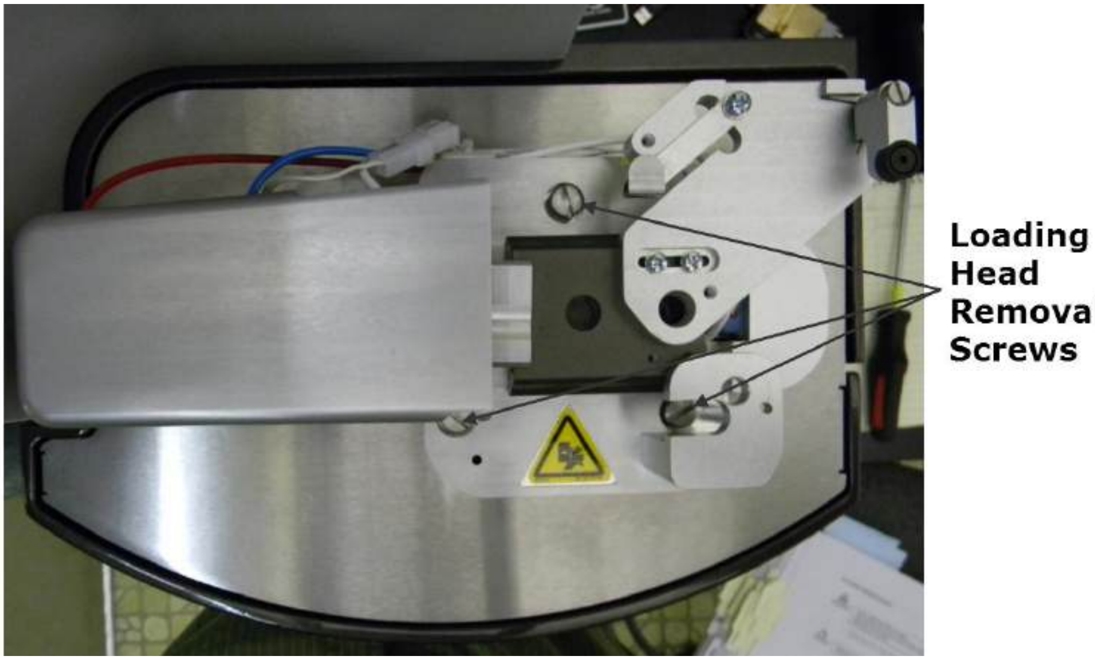


Figure 6-20
Loading Head Removal Screws

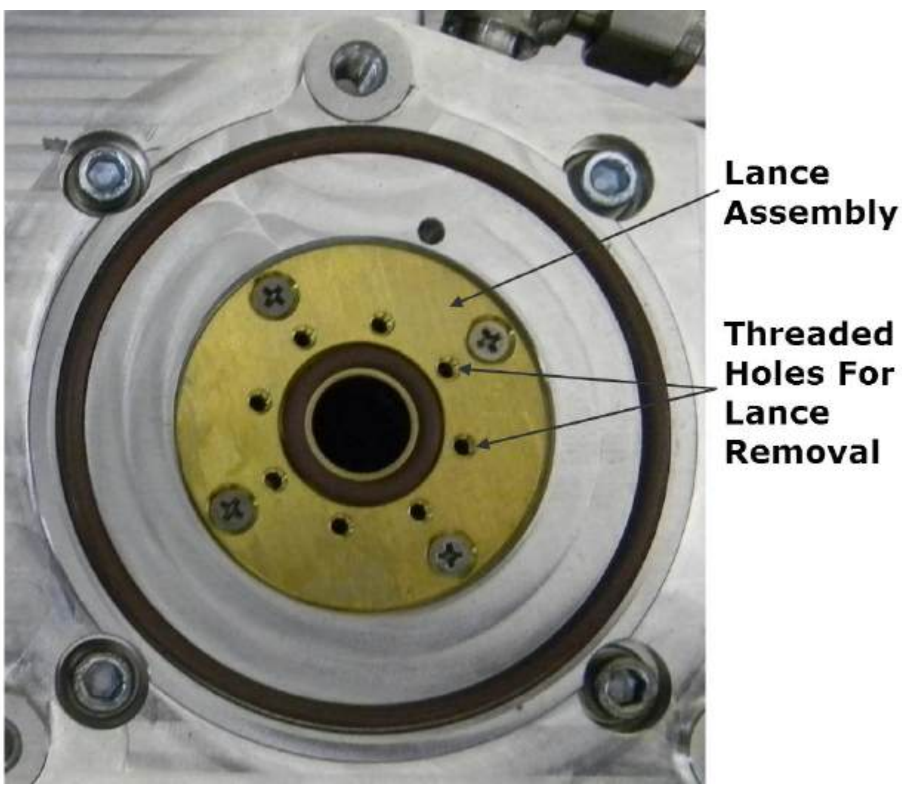


Figure 6-21
Lance Removal

Cleaning the Loading Head

Disassembly

1. Remove the three screws securing the loading head to the furnace. Refer to Figure 6-20, page 6–37.

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 6-22, page 6–38.
4. Clean the inner surface of the slide block and piston. Refer to Figure 6-23, page 6–39.
5. Clean and inspect the o-ring on the coupling block. Refer to Figure 6-22, page 6–38.
6. Turn the loading head over so the bottom is facing up.
7. Locate the lance shield. Refer to Figure 6-24, page 6–40.
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 6-25, page 6–40. Clean the jaw and the inside of loading head.

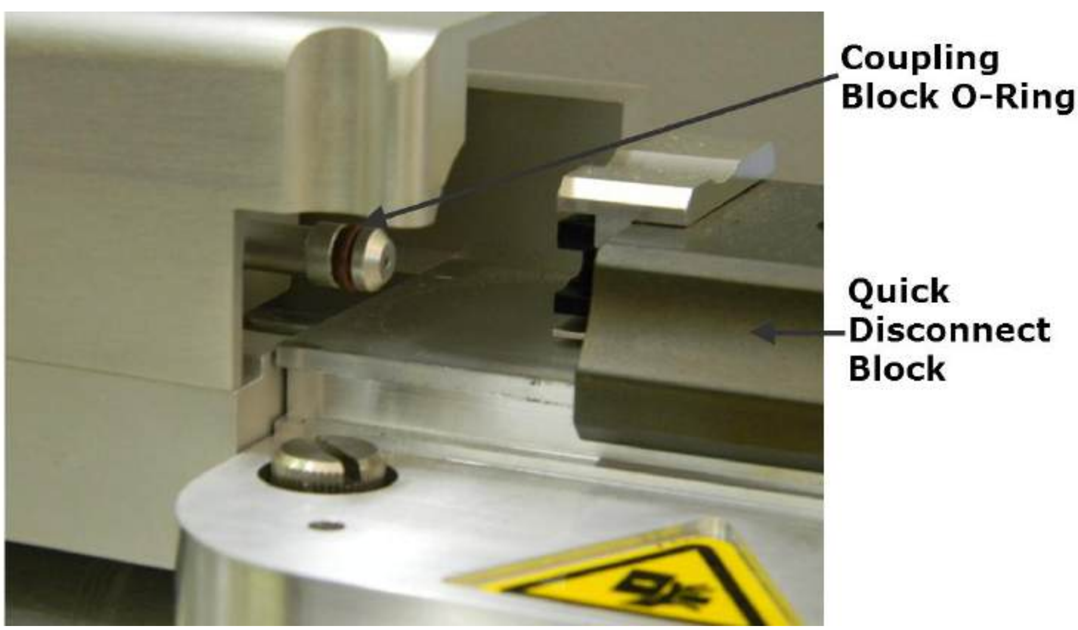


Figure 6-22
Slide Block Removal

Figure 6-23
Slide Block (Bottom View)

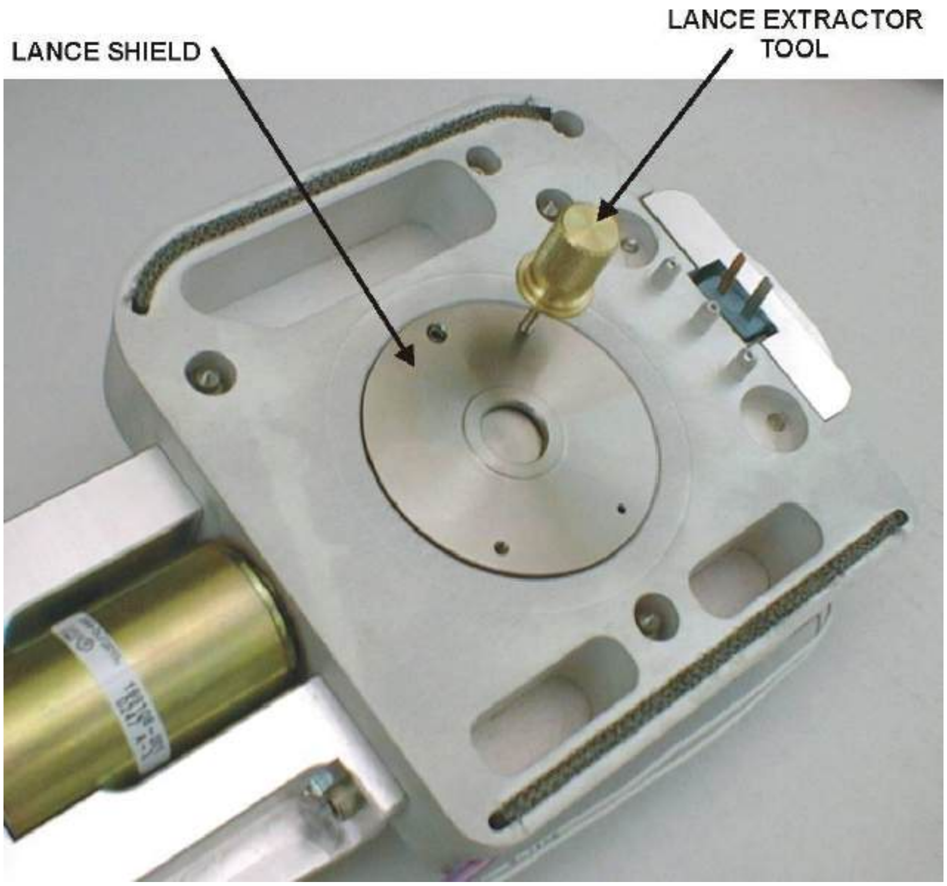


Figure 6-24
Lance Shield and Lance Tool

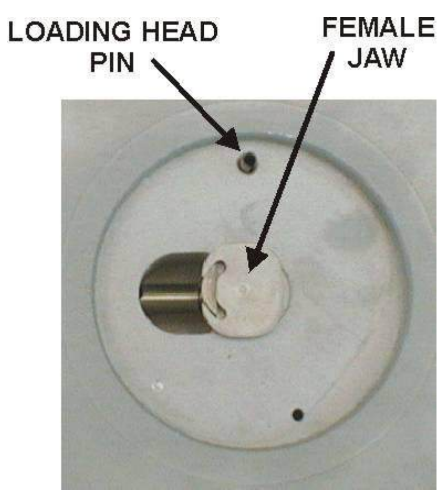


Figure 6-25
Female Jaw and Loading Pin

Reassembly

1. Insert the female jaw into the male jaw. Refer to Figure 6-25, page 6–40.
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 the loading head over.
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.

O-rings

When repacking the reagent tubes or 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; only apply a light coating of grease.

1. Gently remove the o-ring.
2. Lightly grease each o-ring making sure the grease is applied evenly without excess buildup.
3. Reinstall the o-ring.

Packing the Reagent Tube

Replace reagents when the counter reaches its limit (approximately 800).

The reagent tube is also referred to as the measure flow scrubber and the TC carrier gas scrubber.

CAUTION

***Anhydrone* 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 the Safety Data Sheet (SDS) for safe handling and storage procedures.**

NOTE

The reagent tubes are labeled Aliquot Dose Scrubber and Incoming TC Carrier Gas Scrubber. They are located on the top left side of the instrument.

CAUTION

Depressurization of the incoming TC carrier gas scrubber tube is necessary before removal to prevent injury or damage to the tube during the removal process. Refer to Removing, page 6–43, to manually turn Off the gas in the software and wait approximately one minute before attempting to remove the tube, or refer to Depressurizing the Reagent Tube Using the Software Wizard, page 6–44, to use the software wizard.

Removing

1. Turn incoming TC carrier gas Off in the software and close the helium or argon inlet solenoid (SV11) to depressurize the tube for removal, or follow the steps in Depressurizing the Reagent Tube Using the Software Wizard, page 6–44.

   Wait one minute before attempting to remove the reagent tube.

   SV11 will change between helium or argon, depending on which gas is chosen as the carrier gas.

   To turn gas to Off and close helium or argon inlet solenoid (SV11)

   A. From the main software screen, select the pull-down arrow next to the F8 button and select Gas Off.

   B. From Diagnostics/Solenoids/Switches, select the white box to add the check mark next to Helium Analyze Flow (SV11) or Argon Analyze Flow (SV11).

2. Wait one minute for the incoming TC carrier gas scrubber tube to depressurize before removing.

3. Remove retaining clip above the reagent tube.
4. Slide the reagent tube upward until the bottom end can swing free.
5. Tilt out the free end of the reagent tube out and pull it down off the top port.
6. Complete the steps in Packing, page 6–44.

Depressurizing the Reagent Tube Using the Software Wizard

Complete the following steps to depressurize the reagent tube using the software wizard. These steps do not need to be completed if the reagent tube was manually depressurized. Refer to Removing, page 6–43.

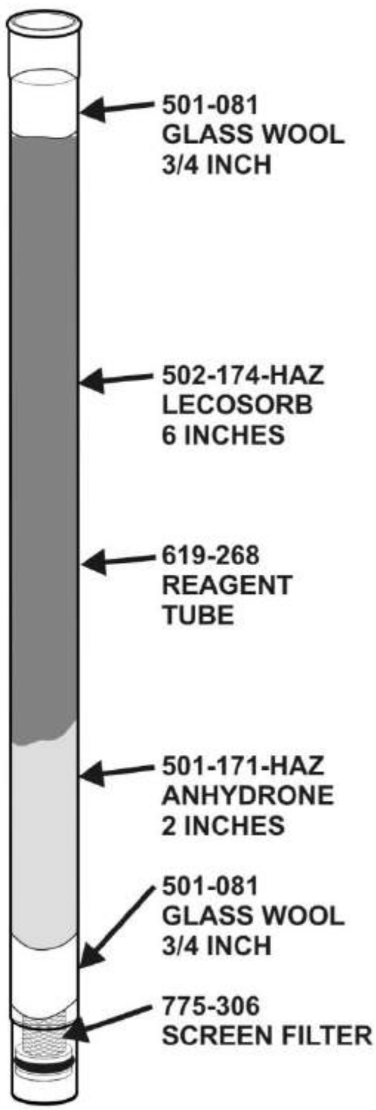
1. Depressurize the reagent tube using the incoming reagent tube removal software wizard. Select Maintenance and then select Incoming Reagent Tube Removal.
2. Select Next when prompted by the software. The carrier gas flow will be turned Off.
3. The carrier gas pressure displays. Once the carrier gas pressure reaches 0 psi, the software will prompt you to remove the incoming helium or argon tube (depending on your carrier gas). Remove the tube by completing steps 4 and 5.
4. Slide the reagent tube upward until the bottom end can swing free.
5. Tilt out the free end of the reagent tube out and pull it down off the top port.
6. Select Next.
7. Replace the reagent tube as prompted by the software, then select Finish. Refer to Packing, page 6–44.

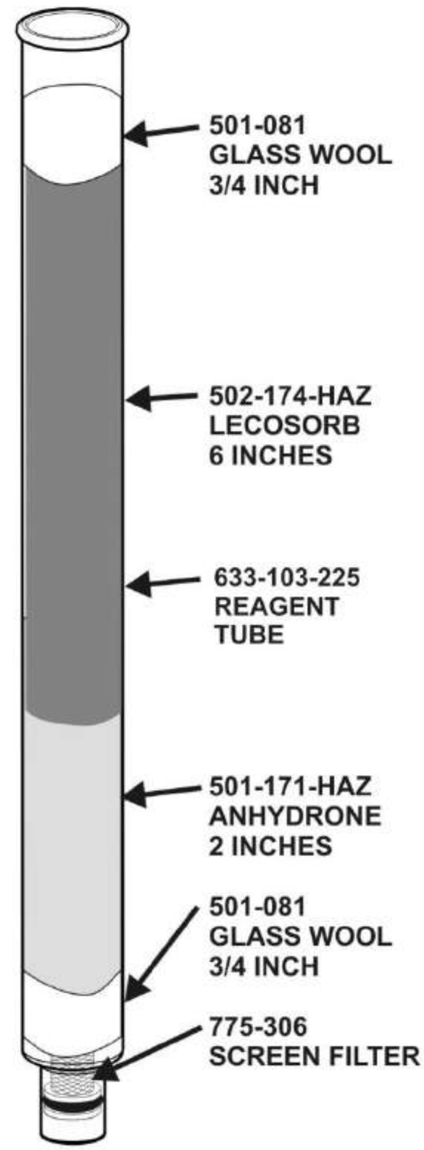
Packing

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 $^{1}/_{4}$-inch. Refer to Figure 6-26, page 6–45.
3. Pack $^{3}/_{4}$-inch of glass wool into the bottom of the reagent tube.
4. Fill the bottom $^{1}/_{3}$ of the reagent tube with *Anhydrone*.
5. Fill the top $^{2}/_{3}$ of the reagent tube with *LECOSORB*.
6. Firmly pack $^{1}/_{2}$-inch to $^{2}/_{3}$-inch of glass wool into the top of the reagent tube.
7. Reinstall the reagent tube.
8. Reset the Reagent Tube Counter under Resetting Maintenance Counters, page 6–59.
9. Clean excessive regent 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.



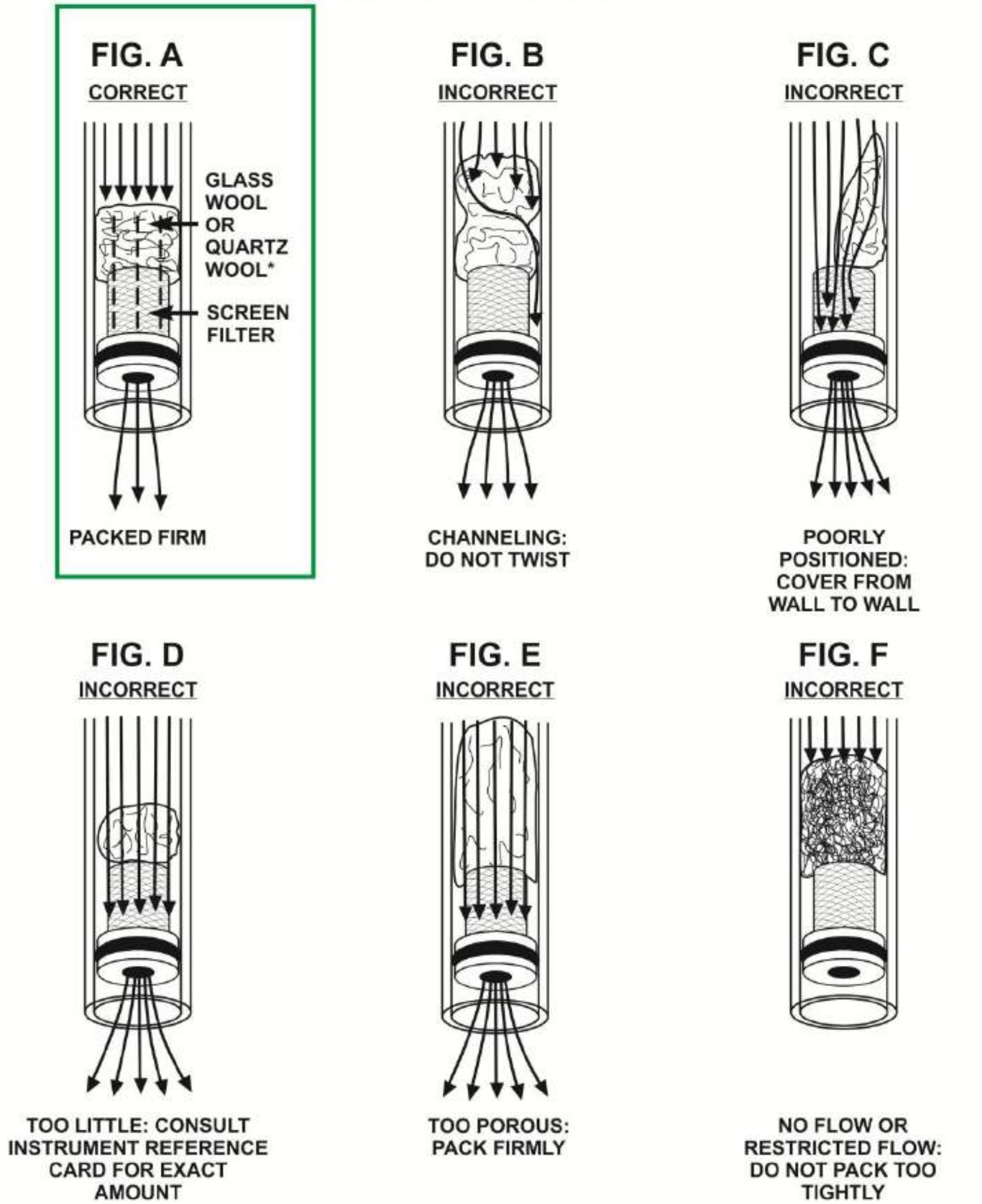


Aliquot Dose Scrubber **Incoming TC Carrier Gas Scrubber**

Figure 6-26
Reagent Tube Packing

PACKING THE REAGENT TUBE

Tube must be packed correctly for proper filtering and flow. The correct method is illustrated in Figure A. The most commonly seen errors and their solutions are depicted in Figures B through F.



THE AMOUNT OF GLASS WOOL OR QUARTZ WOOL REQUIRED IN EACH REAGENT TUBE WILL VARY DEPENDING ON THE INSTRUMENT. CONSULT YOUR INSTRUMENT MANUAL, REFERENCE CARD, OR LECO PROFESSIONAL FOR EXACT AMOUNT.

Cleaning the Primary Furnace Filters

Removing

1. Turn Off the gas.
2. Remove screw and open the door. Refer to Figure 6-28, page 6–49.
3. Remove retaining clip above the glass tube on the right side.
4. Slide the furnace filter tube upward until the bottom end can swing free.
5. Tilt out the free furnace filter tube end.
6. Pull the furnace filter tube downward off the top port.

Cleaning and Repacking

1. Remove the glass tube on the right side. Refer to Figure 6-28, page 6–49.
2. Cut 3 inches of glass wool, fold it in half, and insert it into the bottom of the primary filter tube. Refer to Figure 6-27, page 6–48.
3. Weigh approximately 6 to 7 grams of steel wool, insert it into the primary filter tube, and compress it to 3 inches.
4. Cut 3 inches of glass wool, fold in half, and insert it into the primary filter tube on top of the steel wool.
5. Clean and lightly grease the top port and bottom port o-rings.

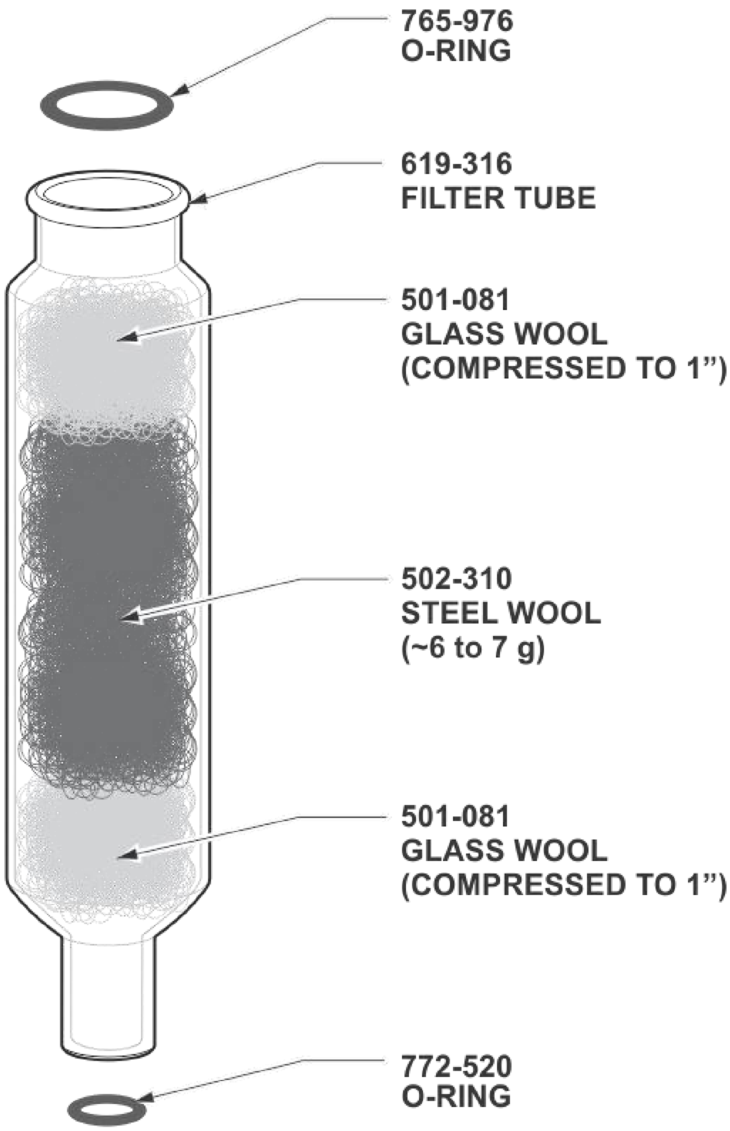


Figure 6-27
Primary Filter Tube

Installing

1. Reinsert the glass tube.
2. Reinstall retaining clip removed in step 3 of Removing, previous.
3. Push the top end of the furnace filter tube over the top port.
4. Tilt the furnace filter tube inward and pull it down, pushing it over the bottom port.
5. Turn On the gas.

Replacing the Balston Filter

NOTE The Balston filter is a disposable particle filter and should be checked each day before analysis, as dirt particles can cause poor results. Replace the Balston filter when filter is visibly dirty.

1. Turn Off the gas.
2. Remove screw and open the door. Refer to Figure 6-28, page 6–49.
3. Slide the Balston filter upward until the bottom end can swing free.
4. Tilt out the free Balston filter tube end.
5. Pull the Balston filter tube downward off the top port.
6. Replace with new Balston filter.
7. Push the top end of the Balston filter tube over the top port.
8. Tilt the Balston filter tube inward and pull it down, pushing it over the bottom port.
9. Turn On the gas.

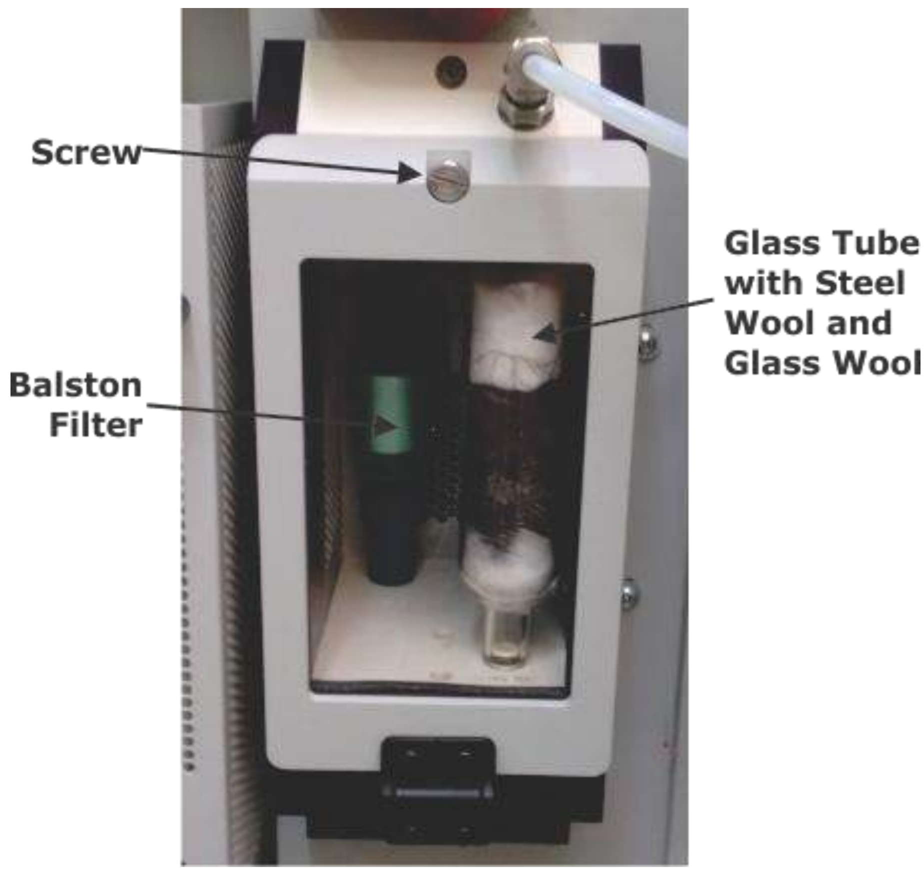


Figure 6-28
Filter Locations

Thermoelectric Cooler

1. Refer to the Shutdown Procedure page 5–14, and turn Off the instrument.
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. Remove the right side panel from the instrument and locate the thermoelectric cooler assembly. Refer to Figure 6-29, page 6–51.
4. Disconnect the input and output gas connections from the thermoelectric cooler assembly.
5. Disconnect the electrical connections to the thermoelectric cooler control card.
6. Disconnect the exhaust tubing from the thermoelectric cooler assembly to the flask on the rear of the instrument. The tubing should be disconnected at the flask.
7. Loosen the mounting screw and push the thermoelectric cooler assembly toward the inside of the instrument until the slot clears the screw.
8. Tilt the thermoelectric cooler assembly up and pull it out of the instrument.
9. Remove the mounting screws in the top of the thermoelectric cooler assembly.
10. Pull the cooling chamber out of the assembly. Refer to Figure 6-29, page 6–52.
11. Remove the four cooling chamber cover screws and remove the cover. Refer to Figure 6-31, page 6–52.
12. Remove the four cooling chamber plate mounting screws and remove the cooling chamber plate. Refer to Figure 6-32, page 6–53.
13. Clean the cooling chamber with water and a nylon scratch pad. Remove all dirt and corrosion. Refer to Figure 6-33, page 6–53.
14. Reassemble the thermoelectric cooler.
15. Disconnect the tubing from the bottom fitting on the precooler assembly. Refer to Figure 6-34, page 6–54.
16. Loosen the two knurled thumbscrews and remove the precooler assembly.

17. Remove the four top plate mounting screws and remove the plate. Refer to Figure 6-35, page 6–54.
18. Clean out the precooler with water and a nylon scratch pad. Remove all dirt and corrosion.
19. Reinstall the precooler into the thermoelectric cooler assembly.
20. Reinstall the thermoelectric cooler assembly into the instrument.
21. Connect the instrument to facility AC power and turn On the instrument.

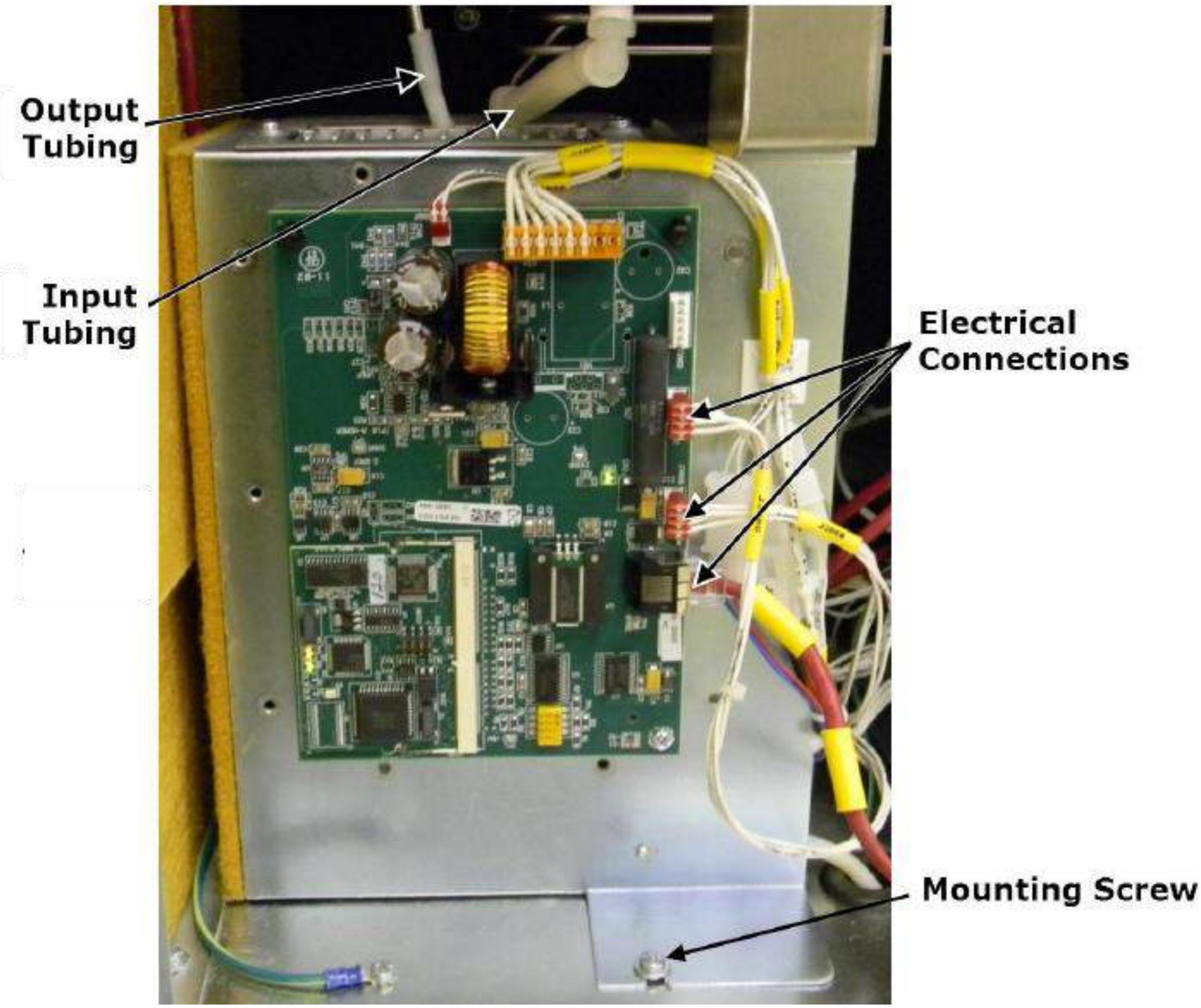


Figure 6-29
Thermoelectric Cooler

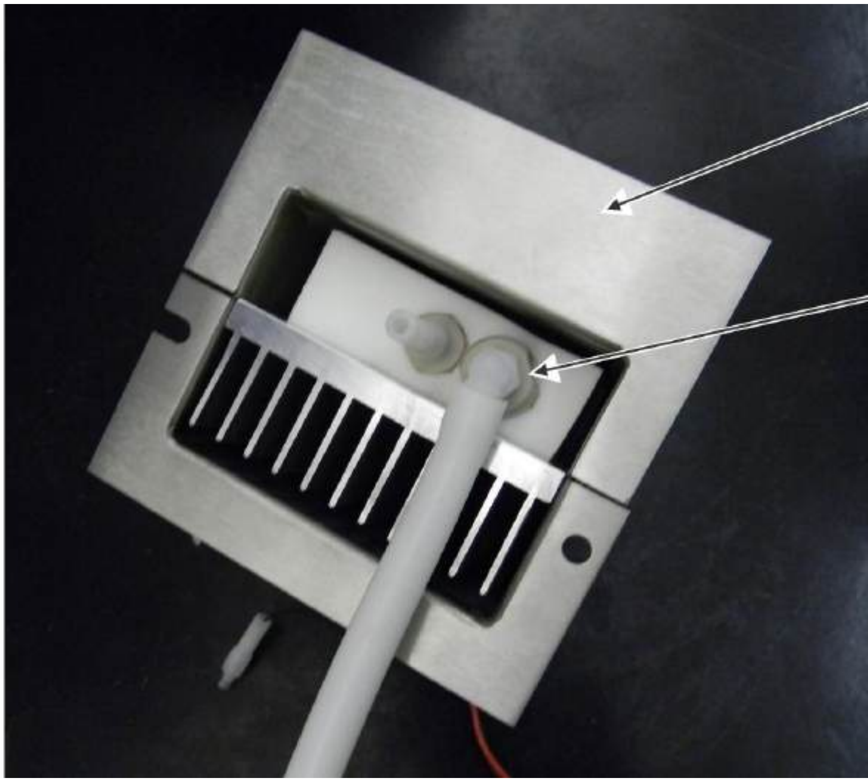


Figure 6-30
Thermoelectric Cooler Chamber

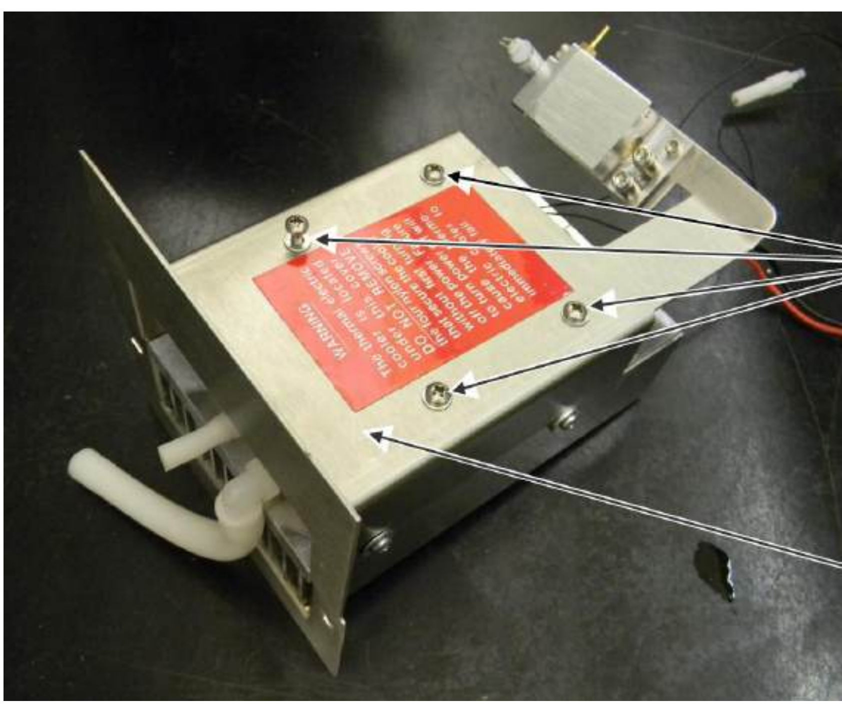


Figure 6-31
Thermoelectric Chamber Cover

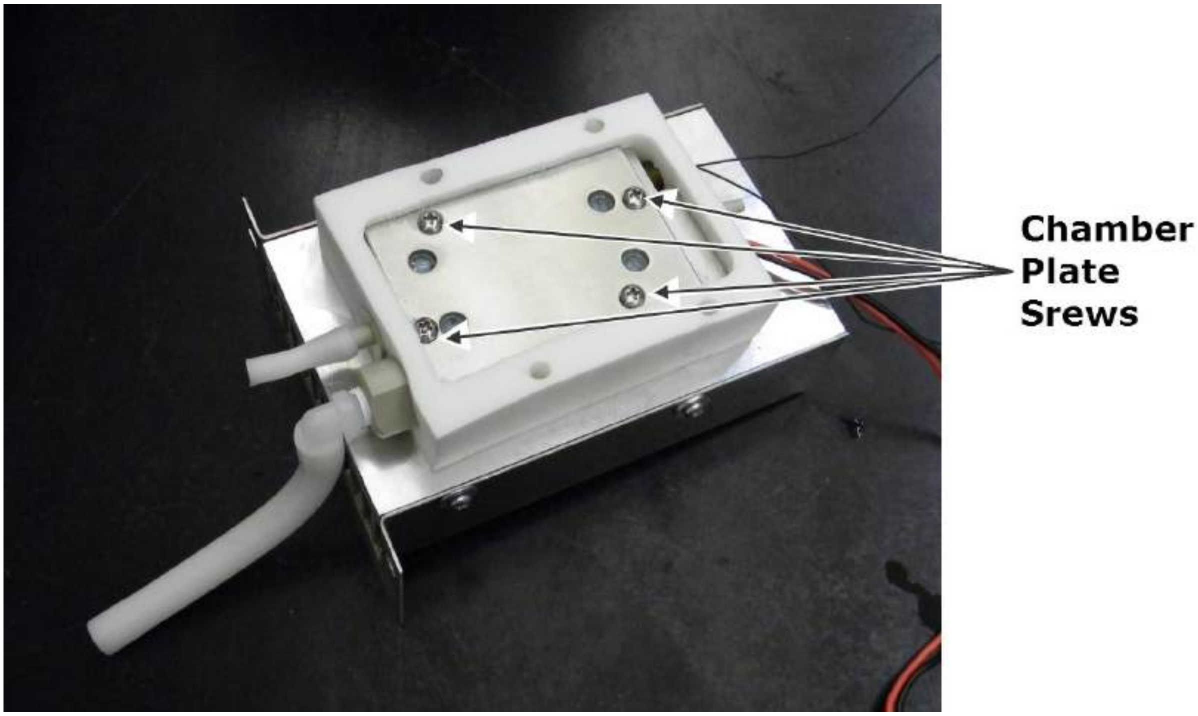


Figure 6-32
Thermoelectric Cooler Chamber Plate

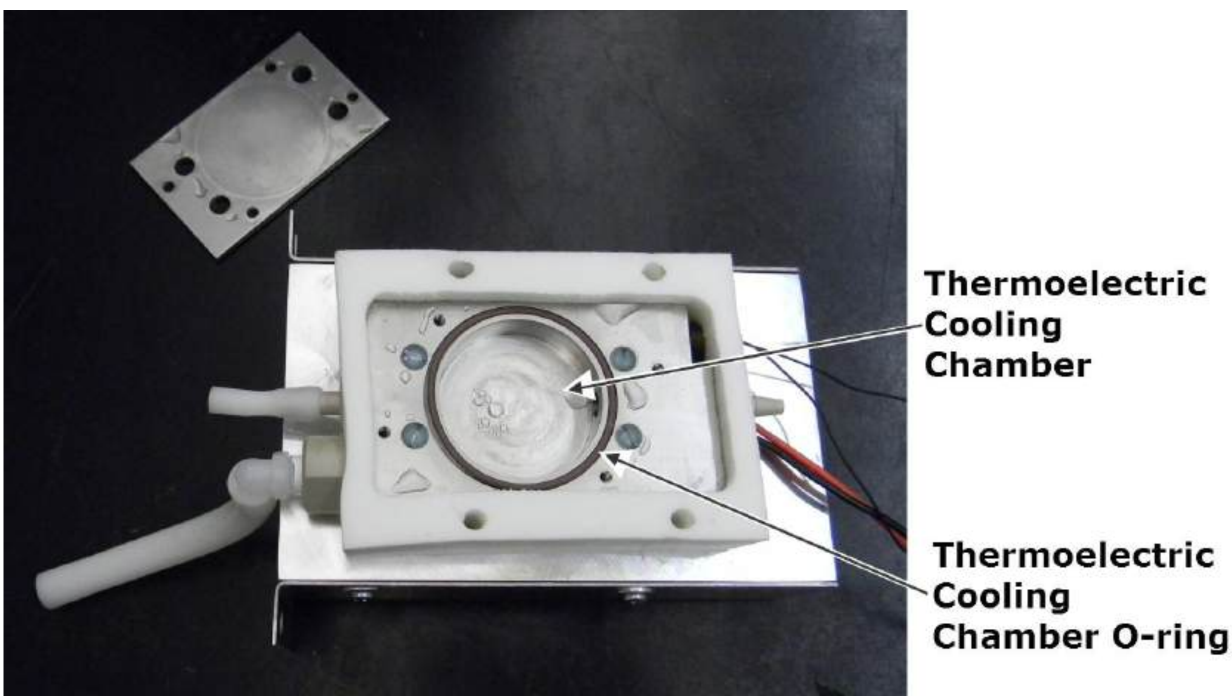


Figure 6-33
Thermoelectric Cooler Chamber

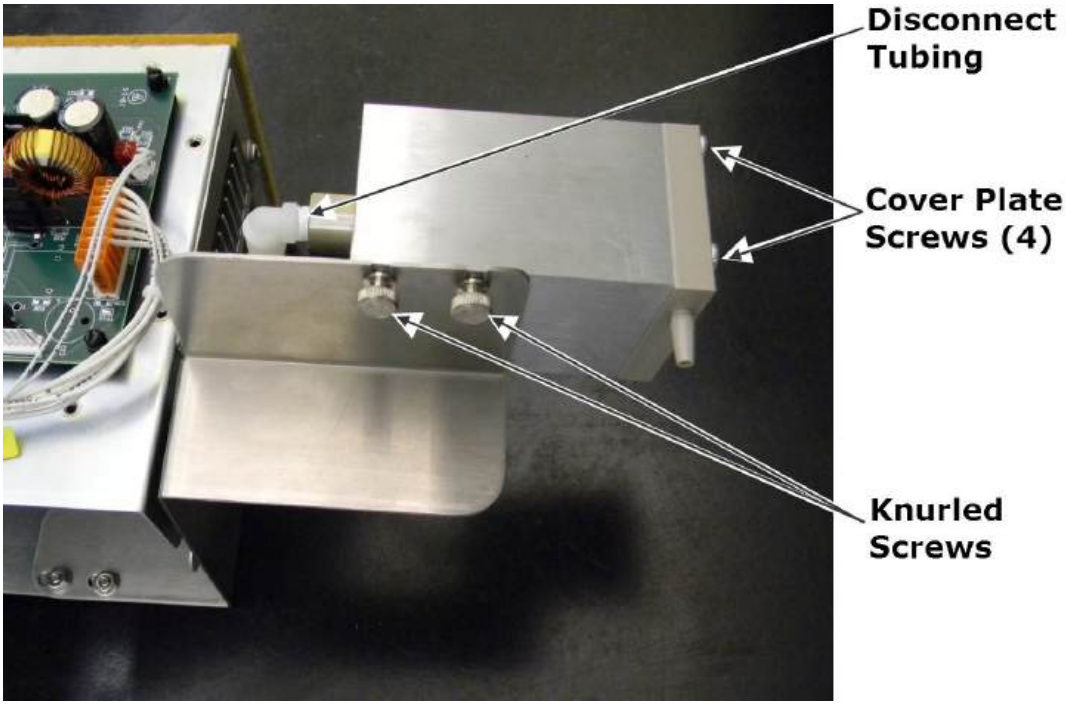


Figure 6-34
Precooler Assembly

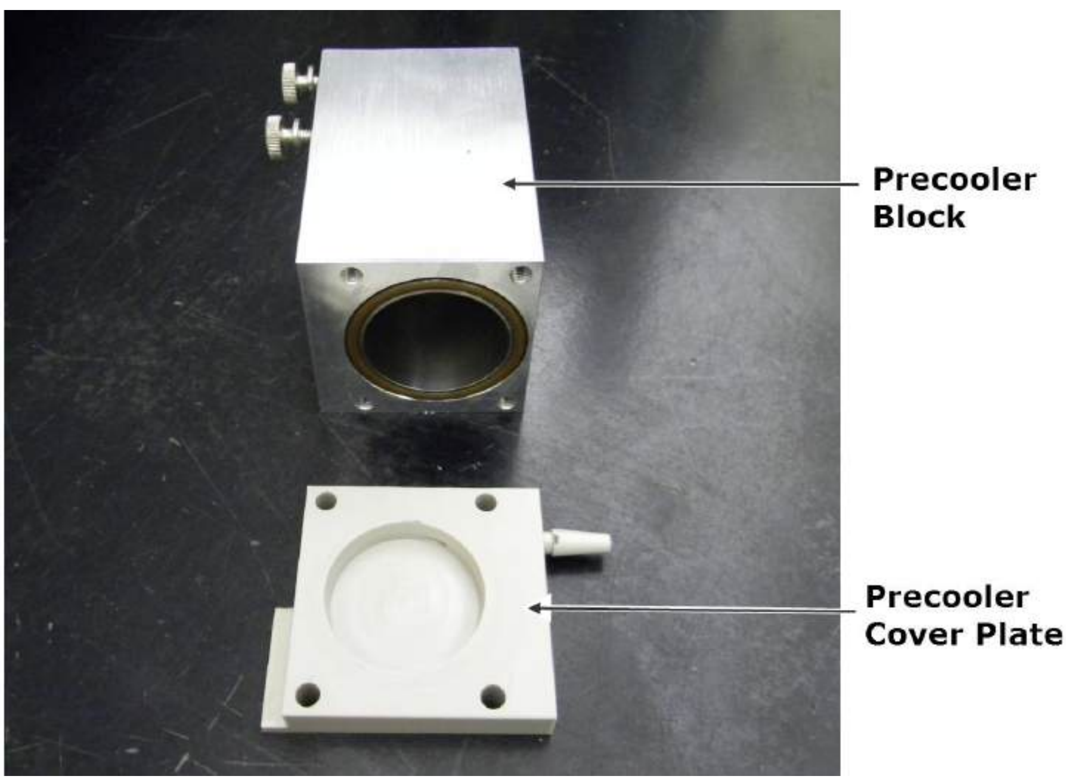
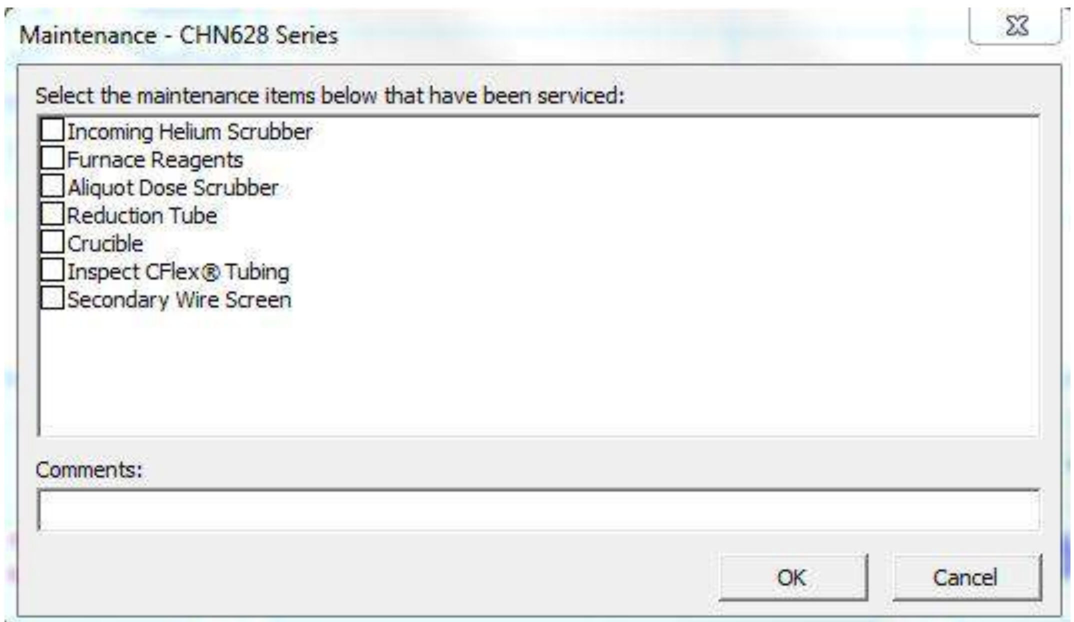


Figure 6-35
Precooler Disassembly

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.



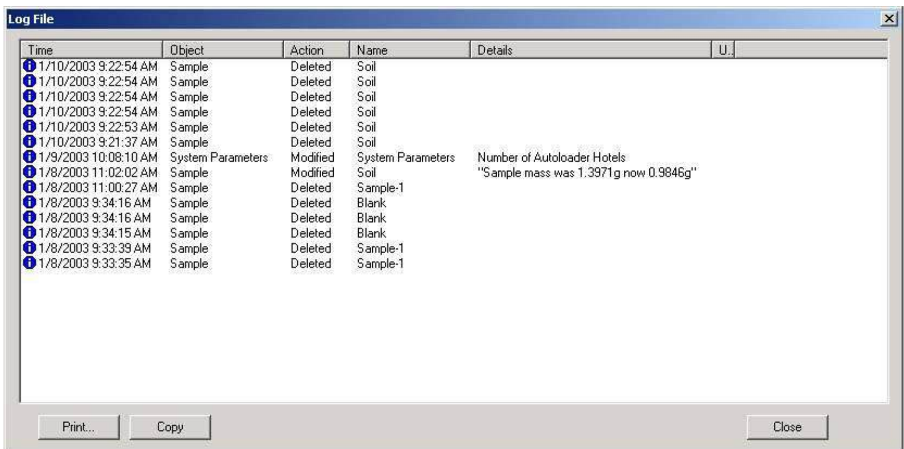
2. Select the checkbox before the item that periodic maintenance was performed on.
3. Select the Comments text box and enter any maintenance comments.
4. Select OK.

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.

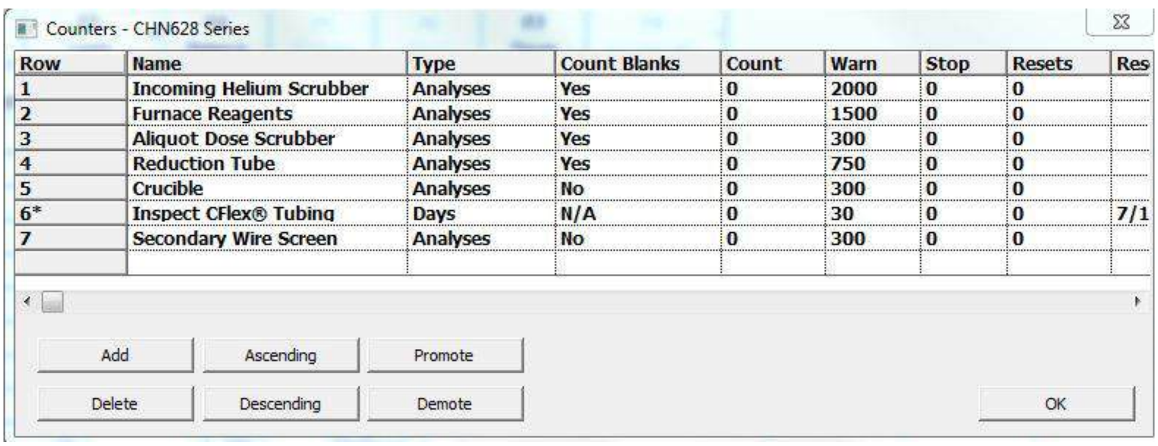


2. Select Print to receive a printout of the log file on the system printer.
3. Select OK when finished.

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 Periodic Maintenance Schedule, page 6–5. The counters should not be reset from this procedure. To reset the counters, refer to Resetting Maintenance Counters, page 6–59.

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 6–58, for additional information.
4. To remove a counter, select it and then 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 then select Promote.
8. To move a counter down toward the bottom of the screen, select the counter and then 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.

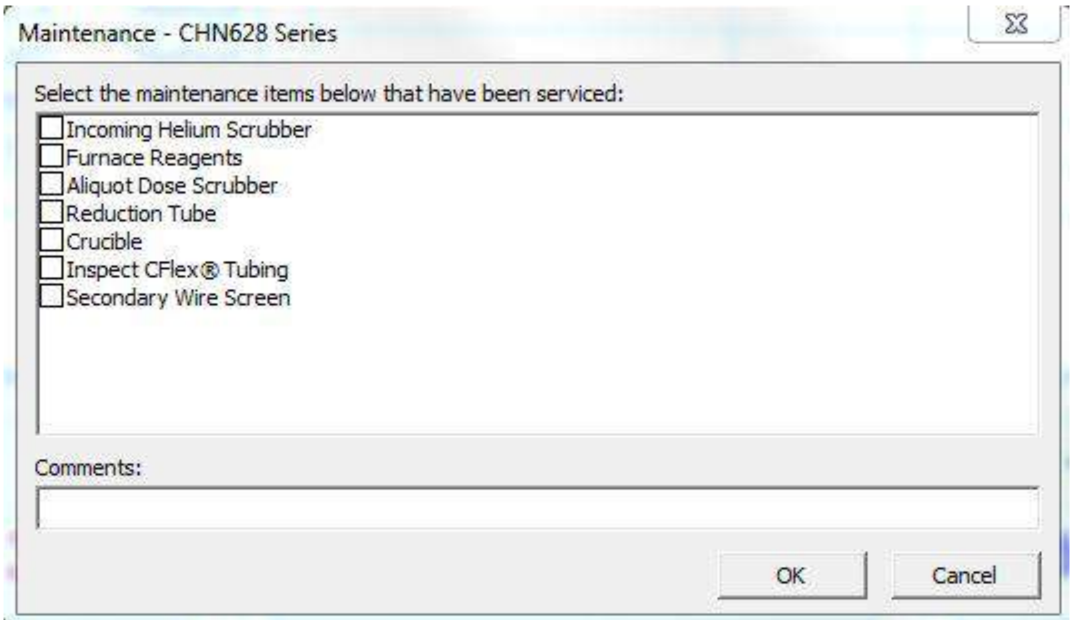
Reset—Displays the date and time the maintenance counter was reset.

Comments—A place for the operator to add notes or comments concerning maintenance.

Resetting 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.

Replacing the Duckbill and Septa

The loading head check valve should be periodically replaced to prevent a combustion gas leak. The life of the check valve will depend on the type of samples being run, but in most cases it should be replaced daily. When the check valve leaks, a hissing noise may be heard, indicating gas escaping from the loading head.

WARNING **When replacing the check valve, the loading head will be hot. Use caution to prevent burns. Use insulated gloves if necessary.**

NOTE For an exploded view of the Liquid Loading Head, refer to Figure 10-49, page 10–57.

1. Using a $^{3}/_{32}$ hex wrench, loosen the two screws in the top of the loading head and swing the cap assembly to the right.
2. Remove the septa using the long end of the hex wrench.
3. Remove the check valve using the long end of the hex wrench.
4. Insert a new check valve into the loading head.
5. Insert the septa into the groove above the check valve.
6. Swing the cap assembly back into place, being careful not to move the septa.
7. Tighten the two screws holding the cap in place.
8. Verify the syringe is properly aligned with the grooves in the cap assembly.

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.

Illustrations

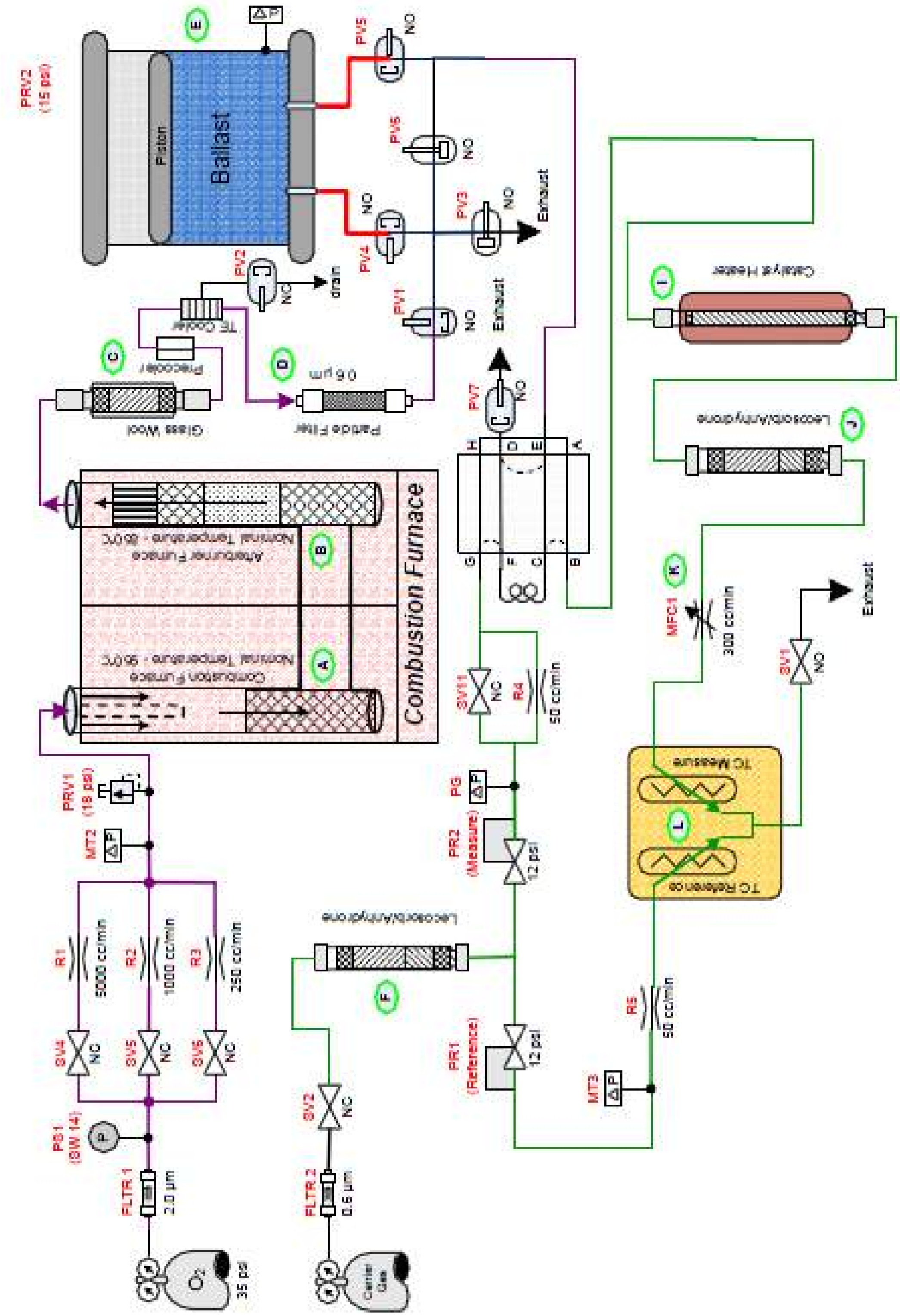
Theory of Operation FP628

NOTE As you read this section, refer to the FP628 Measurement Flow Diagram, page 7–4.

The CHN628 Series Elemental Determinator is used to determine nitrogen, carbon/nitrogen, and carbon/hydrogen/nitrogen in organic matrices. The instrument utilizes a combustion technique and provides a result within 4.5 minutes for all the elements being determined. The instrument features custom Microsoft® Windows®-based software operated through an external PC to control the system operation and data management.

A pre-weighed and encapsulated sample is placed in the instrument's loader, where the sample will be transferred to the instrument's purge chamber directly above the furnace, eliminating the atmospheric gases from the transfer process. The sample is then introduced to the primary furnace containing only pure oxygen, resulting in a rapid and complete combustion (oxidation) of the sample. Carbon, hydrogen, and nitrogen present in the sample are oxidized to carbon dioxide (CO_2), water (H_20), and NO_x respectively, and are swept by the oxygen carrier through a secondary furnace for further oxidation and particulate removal. In the FP and CN628 models, the combustion gases pass through a pre-cooler and thermoelectric cooler to remove the water vapor. The combination gases are then collected in a vessel known as a ballast for equilibration. The homogenized gases from the ballast are swept through a 10 cc aliquot loop and then passed into a carrier gas. Separate optimized non-dispersive infrared (NDIR) cells are utilized for the detection of H_2O and CO_2, ensuring the rapid analysis time of the system. The NO_x gases are passed through a reduction tube filled with copper to reduce the gases to N_2 and remove any excess oxygen present from the combustion process. The aliquot gas then passes through LECOSORB® and Anhydrone® to remove CO_2 and the water generated during the CO_2 trapping process and onto a thermal conductivity cell (TC) utilized to detect the N_2.

The final results are typically displayed in weight percent or parts-per-million but can be displayed in other custom units or conversions such as percent total protein, moisture corrected, and others.



NOTE The FP628 model does not have a CO_2 cell.

Figure 7-1
FP628 Measurement Flow Diagram

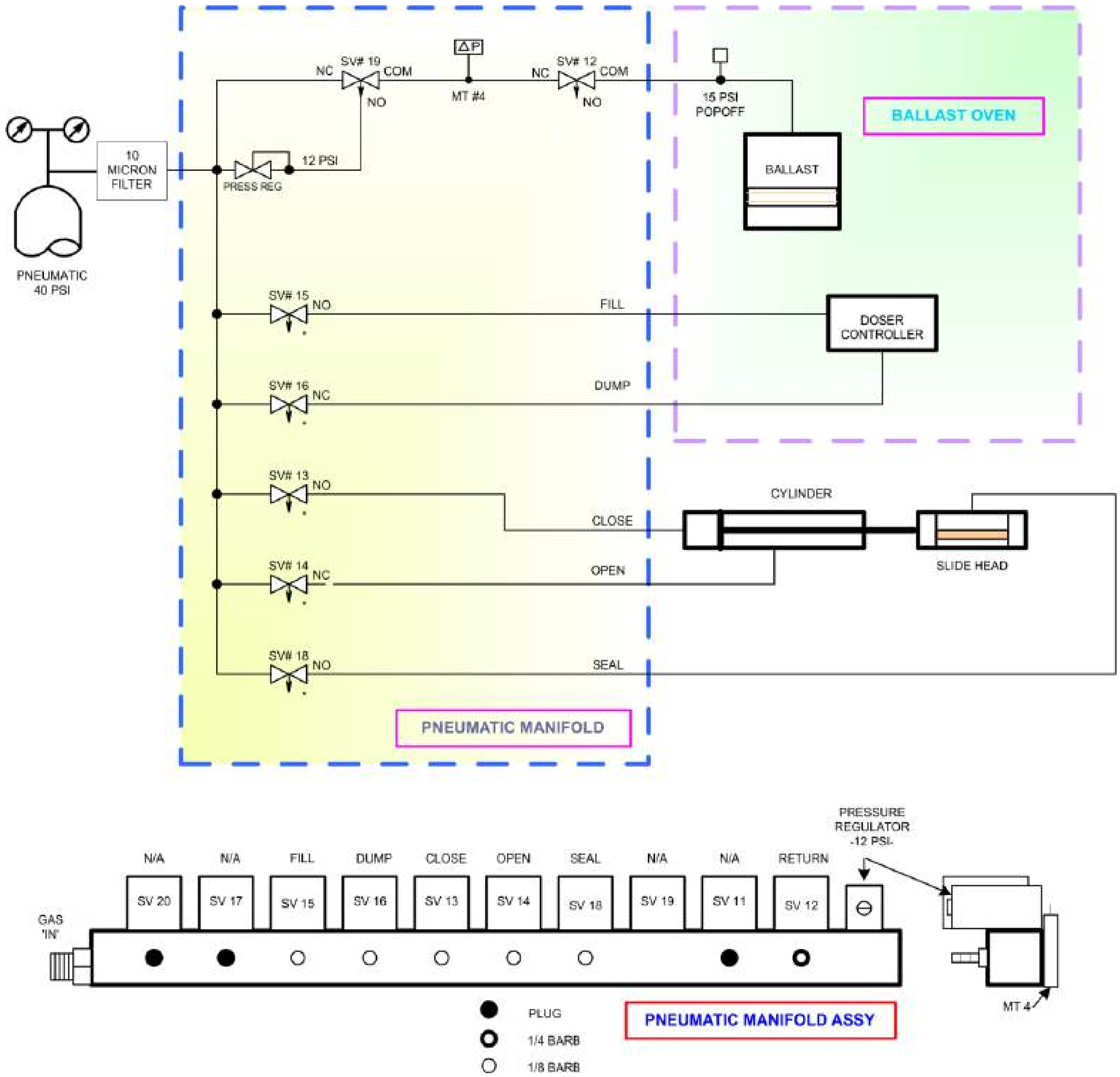


Figure 7-2
Pneumatic Flow Diagram

Method of Standard Additions

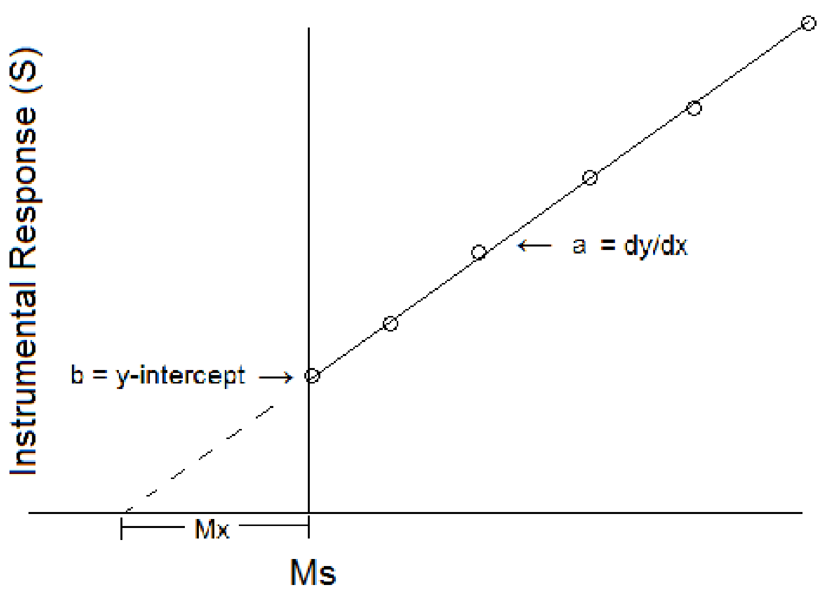
The method of standard additions is a common method for determining analyte concentrations in complex matrices such as soils, biological fluids, etc. Matrix interferences and background for many such samples may result in interferences with analyte signal that cause inaccurate determination of analyte 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 procure 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.

$$S = aM_s + b \qquad (1)$$

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:

$$M_{xcx} = [M_s(0)]cS \qquad (2)$$

where: M_x = mass of the sample aliquot

c_x = concentration of the sample

c_s = concentration of the sample

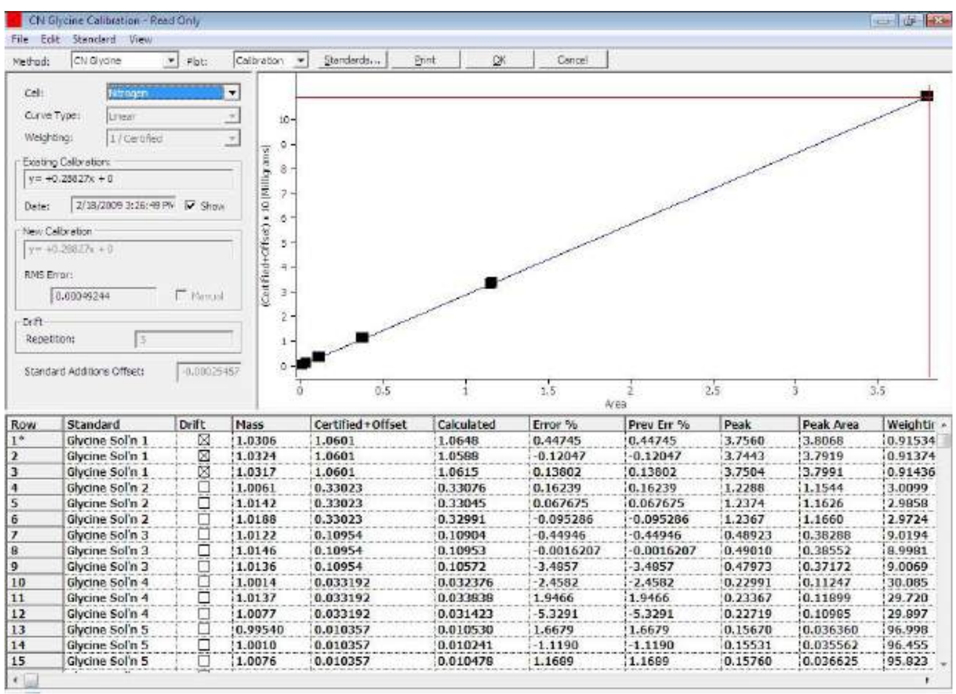
Combining equations 1 and 2 and solving for c_x:

$$c_x = (bc_s/aM_x)$$

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.

In the following calibration screen shot example, linear was selected and the standard additions offset appears on the calibration screen at the left.



Row	Standard	Drift	Mass	Certified+Offset	Calculated	Error %	Prev Err %	Peak	Peak Area	Weightir
1*	Glycine Sol'n 1	☒	1.0306	1.0601	1.0648	0.44745	0.44745	3.7560	3.8068	0.91534
2	Glycine Sol'n 1	☒	1.0324	1.0601	1.0588	-0.12047	-0.12047	3.7443	3.7919	0.91374
3	Glycine Sol'n 1	☒	1.0317	1.0601	1.0615	0.13802	0.13802	3.7504	3.7991	0.91436
4	Glycine Sol'n 2	☐	1.0061	0.33023	0.33076	0.16239	0.16239	1.2288	1.1544	3.0099
5	Glycine Sol'n 2	☐	1.0142	0.33023	0.33045	0.067675	0.067675	1.2374	1.1626	2.9858
6	Glycine Sol'n 2	☐	1.0188	0.33023	0.32991	-0.095286	-0.095286	1.2367	1.1660	2.9724
7	Glycine Sol'n 3	☐	1.0122	0.10954	0.10904	-0.44946	-0.44946	0.48923	0.38288	9.0194
8	Glycine Sol'n 3	☐	1.0146	0.10954	0.10953	-0.0016207	-0.0016207	0.49010	0.38552	8.9981
9	Glycine Sol'n 3	☐	1.0136	0.10954	0.10572	-3.4857	-3.4857	0.47973	0.37172	9.0069
10	Glycine Sol'n 4	☐	1.0014	0.033192	0.032376	-2.4582	-2.4582	0.22991	0.11247	30.085
11	Glycine Sol'n 4	☐	1.0137	0.033192	0.033838	1.9466	1.9466	0.23367	0.11899	29.720
12	Glycine Sol'n 4	☐	1.0077	0.033192	0.031423	-5.3291	-5.3291	0.22719	0.10985	29.897
13	Glycine Sol'n 5	☐	0.99540	0.010357	0.010530	1.6679	1.6679	0.15670	0.036360	96.998
14	Glycine Sol'n 5	☐	1.0010	0.010357	0.010241	-1.1190	-1.1190	0.15531	0.035562	96.455
15	Glycine Sol'n 5	☐	1.0076	0.010357	0.010478	1.1689	1.1689	0.15760	0.036625	95.823

Calculations

The following is a list of calculations used by the software to determine the final analysis result.

Adjusted Mass=Mass * (1 - Sample Moisture/100) * (1/(1 - Moisture Basis/100))

Adjusted Area= ((area * (Conversion Factor) - blank) * drift * Sensitivity Factor.

Nitrogen mg—Adjusted area passed through the calibration curve.

Nitrogen ppm=Nitrogen % * 10,000.

Nitrogen %=Nitrogen mg / adjusted mass.

Drift Factor—Calculates a factor that returns the drift standard to the same calculated value that was determined during the calibration process.

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

Example

Barometric pressure is reported at 750 mm Hg 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:

$$\frac{733 \text{ mm Hg}}{760 \text{ mm Hg}} \quad \text{X} \quad 750 \text{ mm Hg} \quad = \quad 723 \text{ mm Hg}$$

In this example, the barometric pressure to be entered into the instrument is 723 mm Hg.

Thermal Conductivity Cell

The thermal conductivity (TC) cell has the ability to detect differences in the thermal conductivity of gases. Refer to Table 7-1, page 7–11. 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 TC carrier gas (helium or argon) flowing in the measure chamber and reference chamber. The introduction of nitrogen causes a change in the thermal conductivity cell response, due to the fact that nitrogen has a different thermal conductivity than the carrier gas. 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 or argon.

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_2O	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

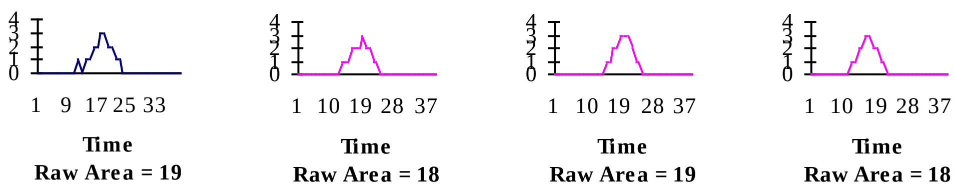
Theory of Calibration

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 *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).

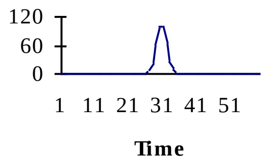


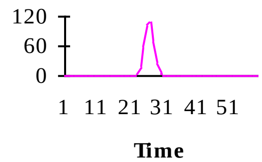
If the four blanks displayed above were selected in the software to calculate a blank, the result would be that the average of the four would be stored as the blank area (Ab).

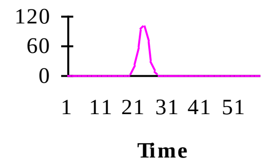
$$Ab = \frac{19+18+19+18}{4} - 18.5$$

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.







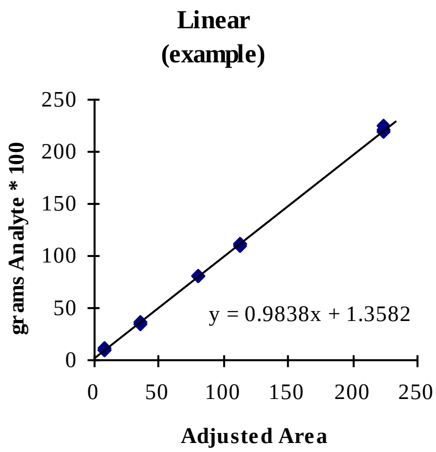
The area under the peak is calculated and stored as a raw area, Ar. The current blank area, Ab, is subtracted from the raw area, Ar, of the standard to yield the Area, A.

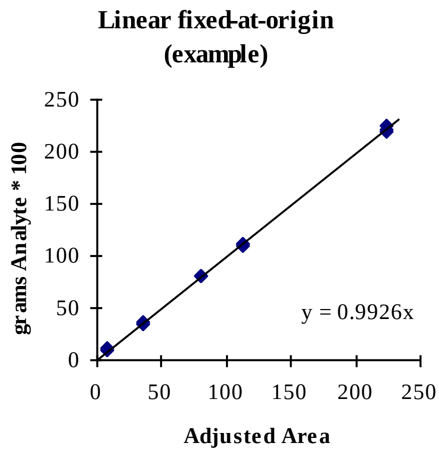
$$A = Ar - Ab$$

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.

$$Aadj = A * \text{Sensitivity Factor} * \text{Drift Factor}$$

The resultant adjusted area, Aadj, 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 offset a natural bias to higher concentration standards during the least squares fitting process.

Aadj is now taken through the calibration curve to yield grams analyte * 100.

*grams Analyte * 100 = Adjusted Area * Slope + 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.

$$\%\ Analyte = \frac{grams\ Analyte * 100}{Sample\ Mass} - Atmospheric\ Blank$$

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 Conversion 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.

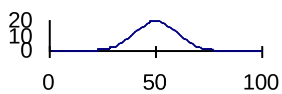
Drift Factor—A factor that is applied to the signal of an analyzed defined standard to adjust it to the expected signal; based on information extrapolated from the calibration curve. It is then used to adjust analyte signals to correct for instrument drift.

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.

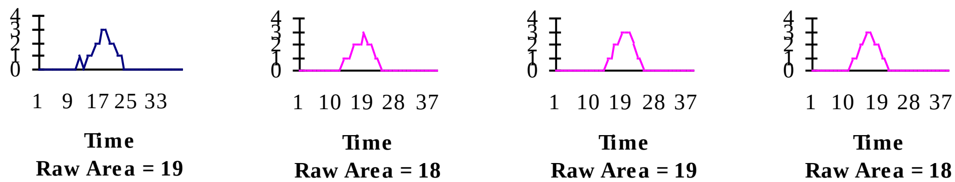
Sample—A determined mass of a substance of unknown analyte concentration. The analyte concentration will be determined by performing the analysis.

Sensitivity Factor—A multiplicative factor applied to the adjusted area (Aadj) 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 (Ar).



If the four blanks displayed above 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).

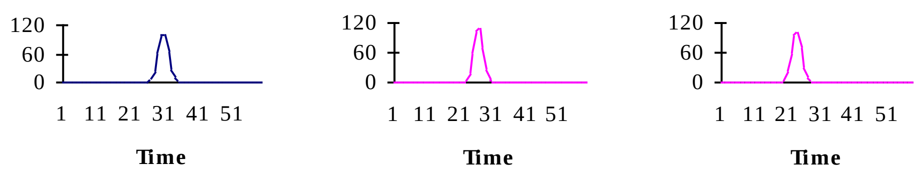
$$Ab = \frac{19+18+19+18}{4} = 18.5$$

The 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 printout 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, Ab, 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).

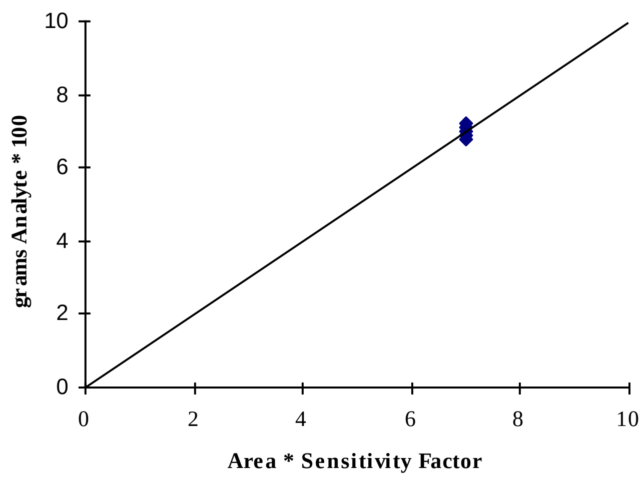
grams Analyte * 100 = A * Sensitivity Factor * Calibration Factor

The result is displayed generally as a percentage. This is calculated by dividing the absolute amount of analyte, A2, 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.

$$\text{Calibration Factor} = \frac{\text{known \% Analyte in Standard}}{\text{Average \% Analyte in Standard obtained by Analysis}}$$



Slope = 1

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 any time 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 determined by comparing the calculated concentration from the original calibration curve to the calculated concentration from the drift point. The resultant ratio is called the Drift Factor:

Drift Factor = Calculated Concentration from Calibration Curve ÷ Calculated Concentration from Drift Point

NOTE The drift factor uses the calculated concentration from the calibration curve and not the certified value.

The drift factor is then multiplied with the measured concentration to make minor corrections to the accuracy of results. The resulting value is the drift-corrected concentration. This method compensates for changes that cannot be attributed to blank or method changes.

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:

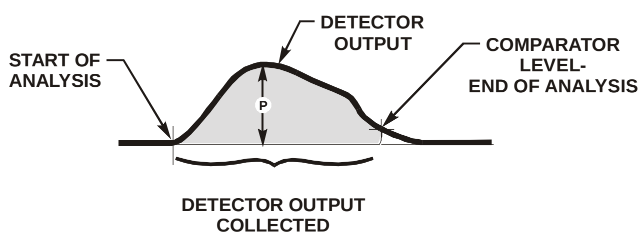
Method Comparator Level = 5 + (X)(P).

Where P = detector A/D output peak and X = selected comparator level percentage.

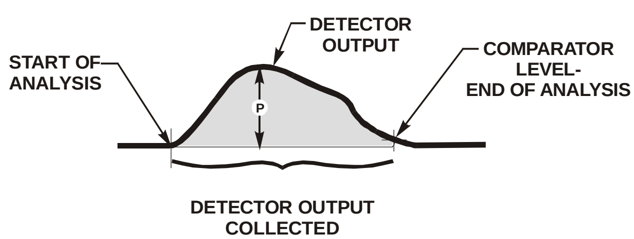
During an analysis, the output of the detector, in the form of digital data, is collected and summed to arrive at the analysis result. If this data were plotted, it would reflect the "curve" of the detector output.

Shown as follows 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%.

End of Analysis where "X" equals 25.0%



End of Analysis where "X" equals 6%



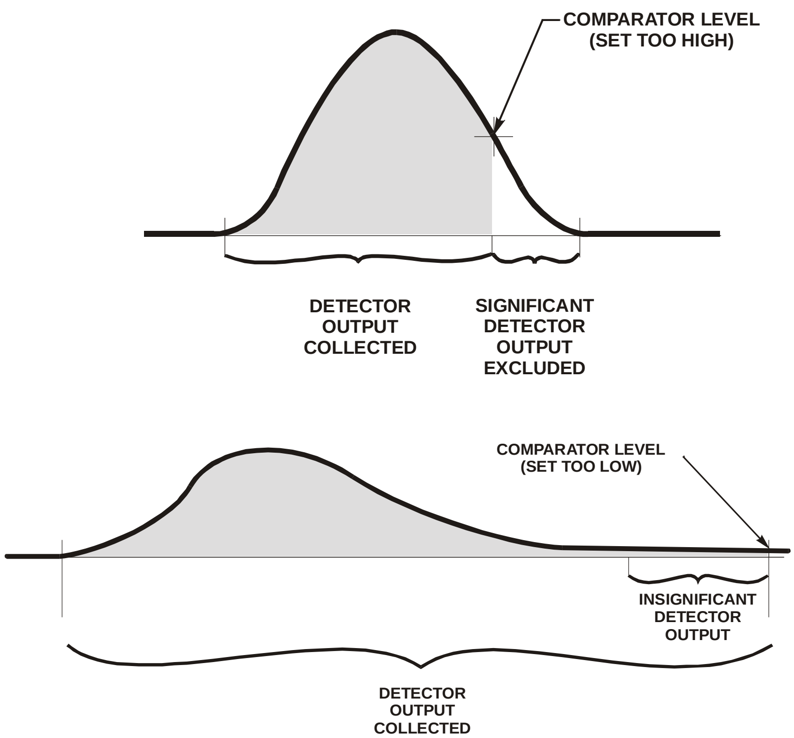
The following conclusions can be drawn from the examples:

- 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 because interaction can occur.



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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.

Illustrations

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Ambient Monitor

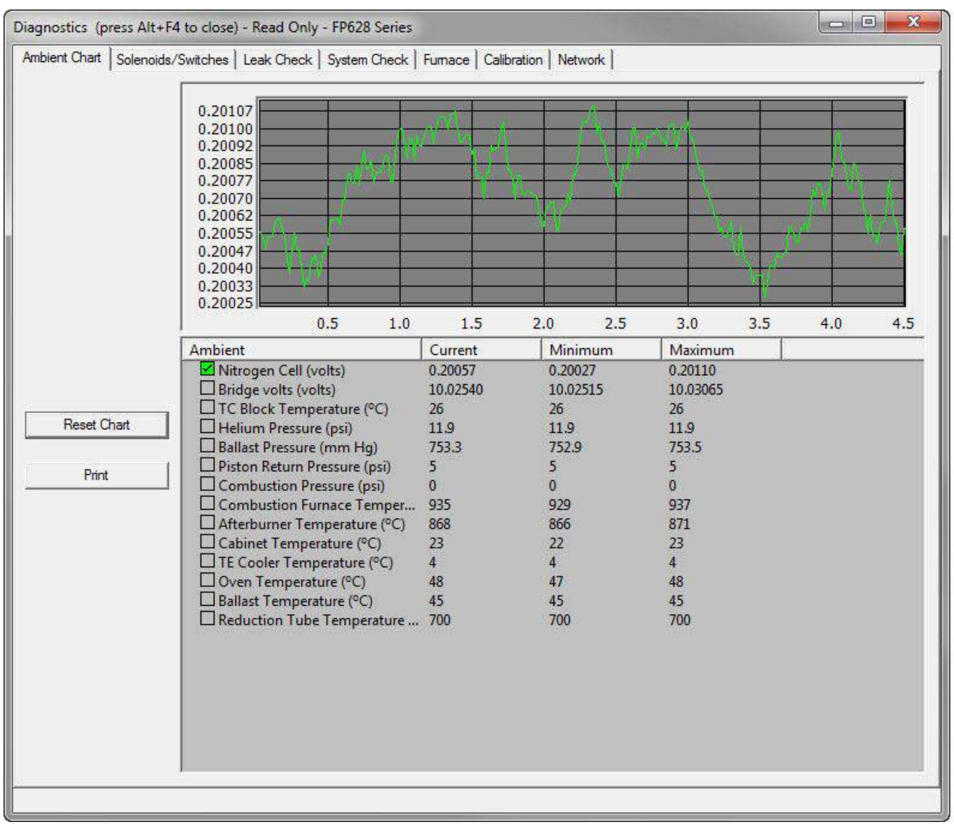
The Ambient Monitor permits the service technician or operator to monitor instrument parameters and determine their status. Ambient Chart provides system parameters on a chart and graph. The selected parameters are not selectable by the operator; they were selected by LECO as being the most critical to monitor.

Refer to Ambient Monitor Definitions, page 8–6, 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 8–7. 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 (CTRL) 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. Right-click 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 8–7 for Ambient Monitor Ranges.

Nitrogen Cell—The TC Cell output voltage in 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.

TC Block Temperature—The temperature of the heated TC cell.

Carrier Gas Pressure—The pressure of carrier gas on the reference flow.

Ballast Pressure—The pressure of the ballast oven compartment.

Piston Return Pressure—The pressure of pneumatic gas at the top of the ballast.

Piston Return Pressure—The pressure of pneumatic gas at the top of the ballast.

Pneumatic Incoming Pressure—Depending on the valve state, the pressure of the incoming pneumatic gas, the regulated pneumatic pressure, and the ballast piston backpressure are measured by this parameter.

Combustion Pressure—The pressure of the combustion gas as it enters the furnace. The values measured by pressure transducers MT02.

Combustion Furnace Temperature—The temperature of the combustion furnace. Range: Ambient to 1050°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. The temperature range 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.

TE Cooler Temperature—The internal temperature of the Thermoelectric Cooler. Nominal Temperature: 5°C.

Oven Temperature—The temperature of the IR and TC cell oven compartment.

Ballast Temperature—Temperature of the ballast tube.

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.

Ballast Oven Temperature—The temperature of the ballast oven compartment.

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
Nitrogen	0.0 volts	1.5 volts
Bridge Volts	5.0 volts	11 volts
Ballast Pressure	720 mm Hg	1300 mm Hg
Combustion Flow	0 lpm	6 lpm
Pneumatic Incoming Pressure	0 psi	42 psi
Combustion Pressure	0 psi	20 psi
Combustion Furnace Temperature	900°C	1050°C
Afterburner Temperature	Ambient	1050°C
Cabinet Temperature	Ambient	50°C
TE Cooler Temperature	2°C	10°C
Oven Temperature	45°C	55°C
Ballast Temperature	45°C	55°C
Reduction Tube Temperature	690°C	710°C
Ballast Oven Temperature	45°C	55°C
TC Carrier Gas Pressure*	11.8 psi*	13 psi*
TC Cell Temperature	57.1°C	57.5°C

*Minimum and maximum pressure above the pressure measured when the gas is Off.

Calibrations

Calibrations permit the service technician or operator to set the barometric pressure, combustion flow calibration, select the ballast size, and perform a backup calibration using the calibration disk supplied with the instrument.

Set (Barometric) Pressure

Set Pressure permits the service technician or operator to calibrate the barometric transducer located in the instrument.

Calibration is necessary for proper analysis results and varies with the location of the instrument. This procedure must be done when the instrument is installed at location. For more information about barometric pressure, refer to Barometric Pressure, page 7–9.

To set the barometric pressure, refer to Calibrating Barometric Pressure for TC Cell, page 4–36.

Ballast Target Pressure

NOTE This procedure ensures proper ballast pressure based on the altitude of the instrument. This procedure should be performed during installation.

To set the ballast target pressure, refer to Setting Altitude for Ballast Target Pressure, page 4–37.

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 text box and select Set Bridge. The gain factor must be between 0 and 255. This can be used for troubleshooting or servicing the instrument.

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 back up 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 may ever need to restore them to earlier defined hardware calibration values.

Backup Calibration saves the following parameter values:

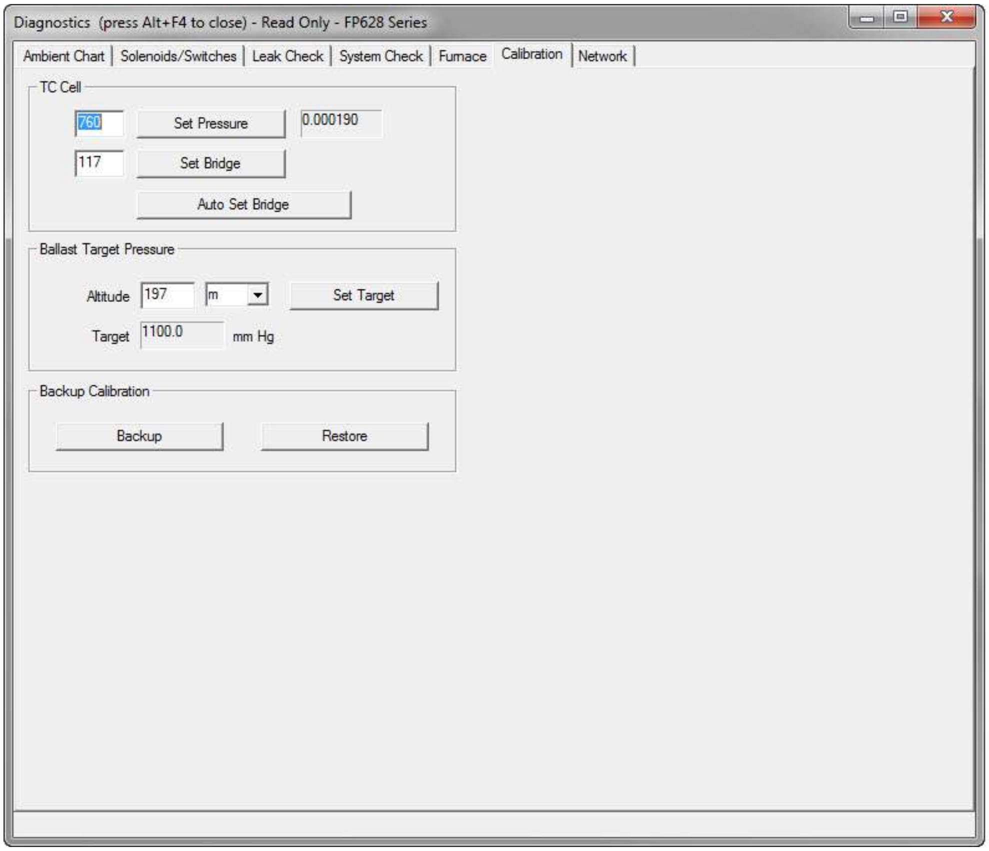
- Barometric Pressure Calibration
- Combustion Flow Calibration
- TC Bridge Value
- Furnace Calibrations

Perform this procedure if it may ever be necessary to restore calibration values that were lost.

The instrument automatically saves the calibration values in a system file; it is not necessary to perform this procedure to save the current calibration values.

Backup Calibration Values

1. Select Diagnostics and select Calibration. The Calibration screen will appear.

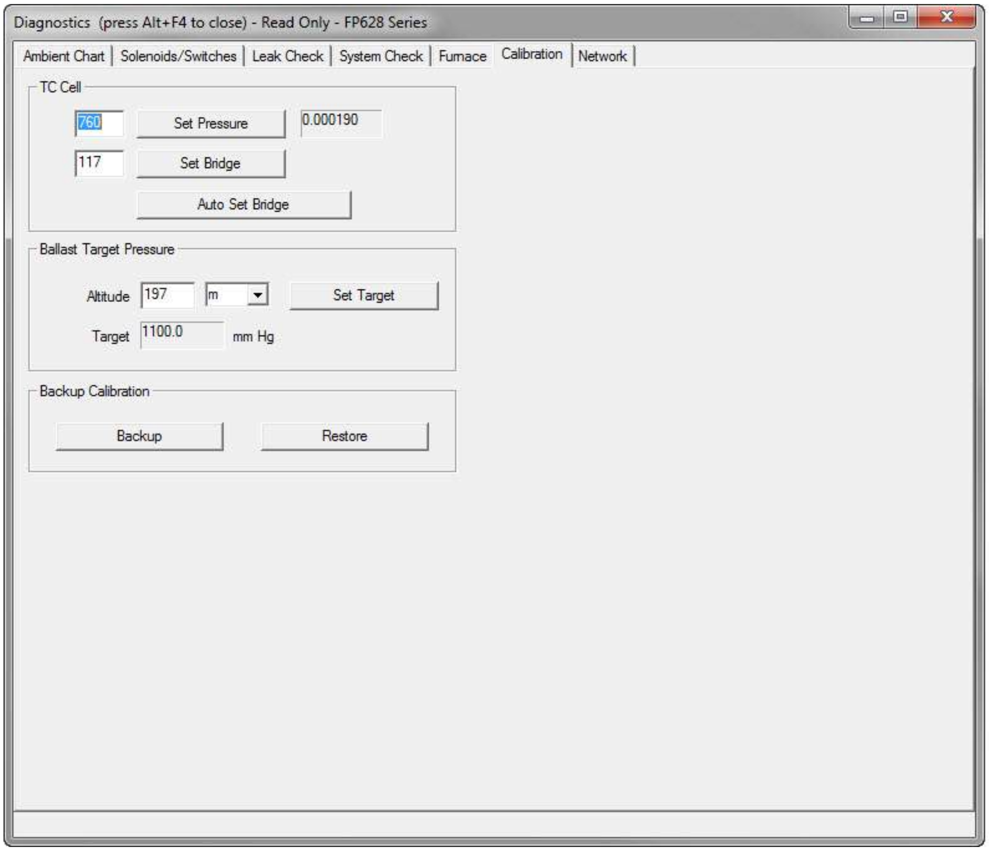


2. Select Backup to create a backup file of the hardware calibration parameter values. The file Save As dialog box will appear.

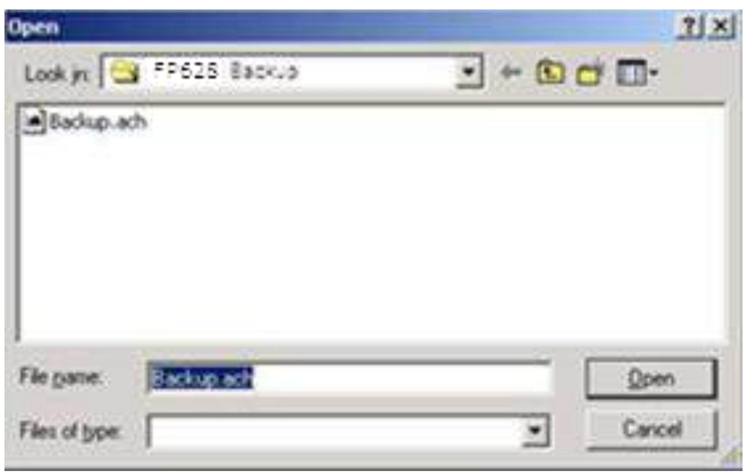
3. Enter the file name and folder location in the dialog box.
4. Select Save to save the backup file.

Restoring Calibration Values

1. Select Diagnostics and select Calibration. The 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.

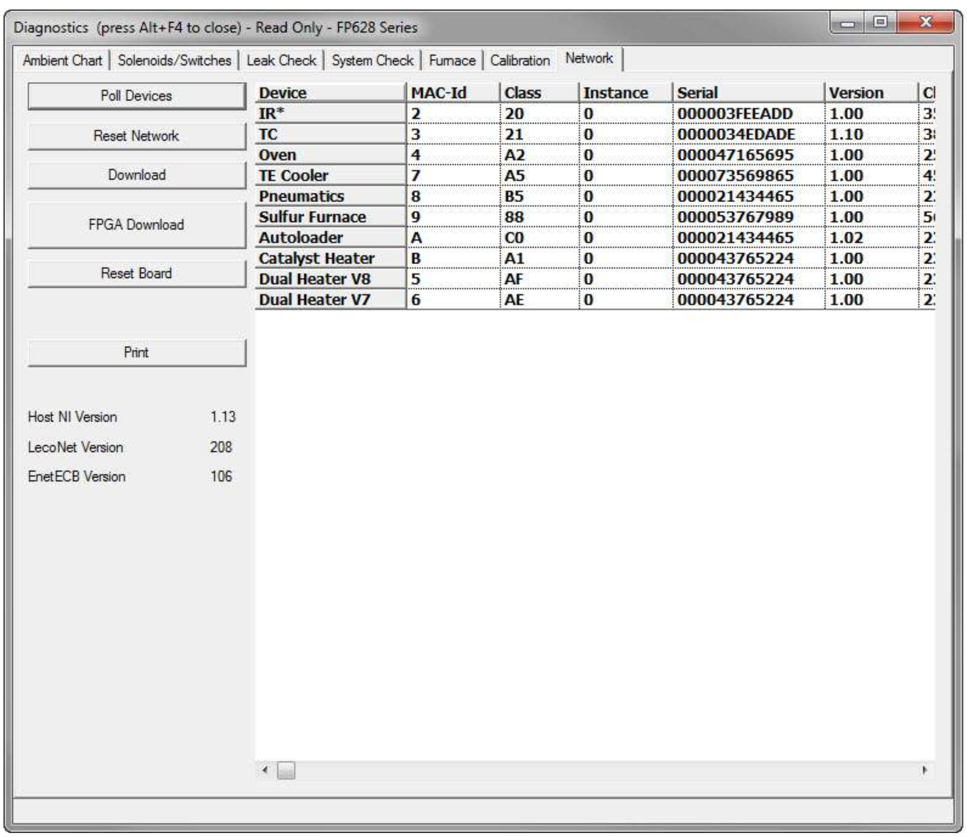
Network Diagnostics

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 8–14.

1. Select on the Diagnostics tab.
2. Select Network.
3. The Network screen will appear.



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. There 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.

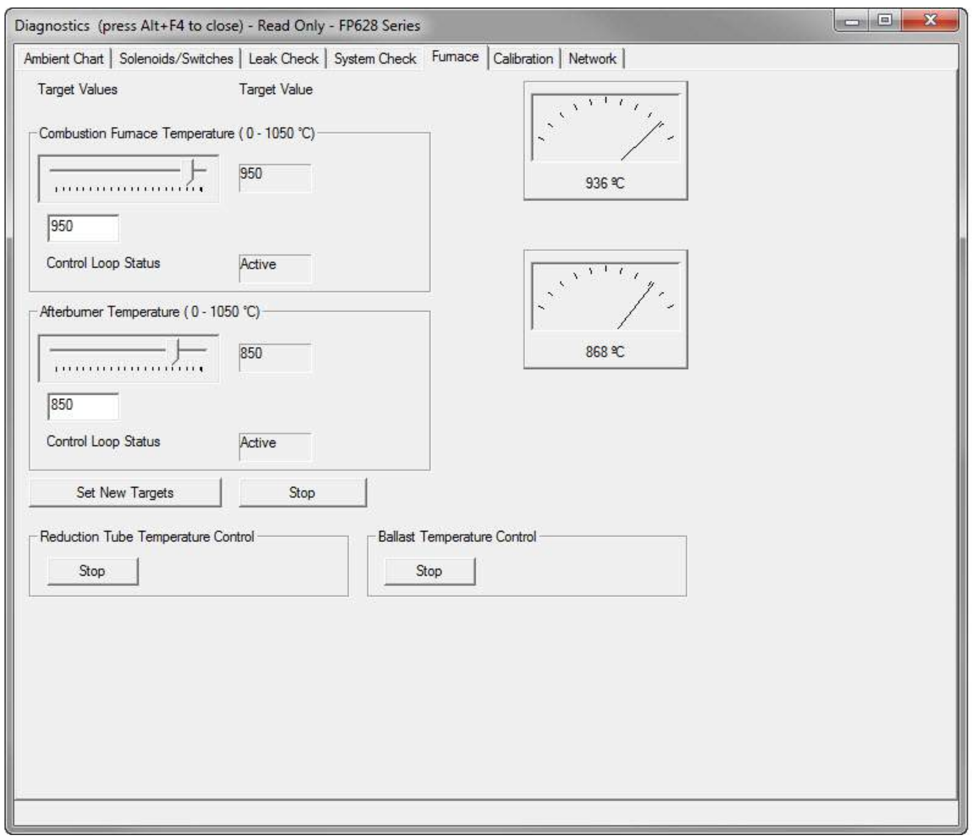
FPGA Version—The version of the FPGA (Field Programmable Gate Array) software.

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 8–18.

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.

CAUTION

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 text 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.
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 the 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.

Ballast Oven Temperature Control

The ballast oven temperature control dialog box is used to turn the ballast oven heater Off or On. When the control is turned On, the ballast oven temperature is automatically set to 45°C.

1. Select Stop to turn Off temperature control of the ballast oven heater.
2. Select Restart to turn On temperature control of the ballast oven 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 combustion (oxygen) and measurement (carrier gas) system of the instrument for a gas leak. The entire system or a segment of the system can be checked. Performing both tests can isolate a leak. If the system leak check fails, perform a segmented test to determine which section of the system is leaking.

During a leak check, the system is pressured above current system furnace pressure and sealed. It is 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 mm Hg 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 30 minutes before performing a leak check. A whole oxygen and a whole carrier gas leak check should be performed at the start of each day.

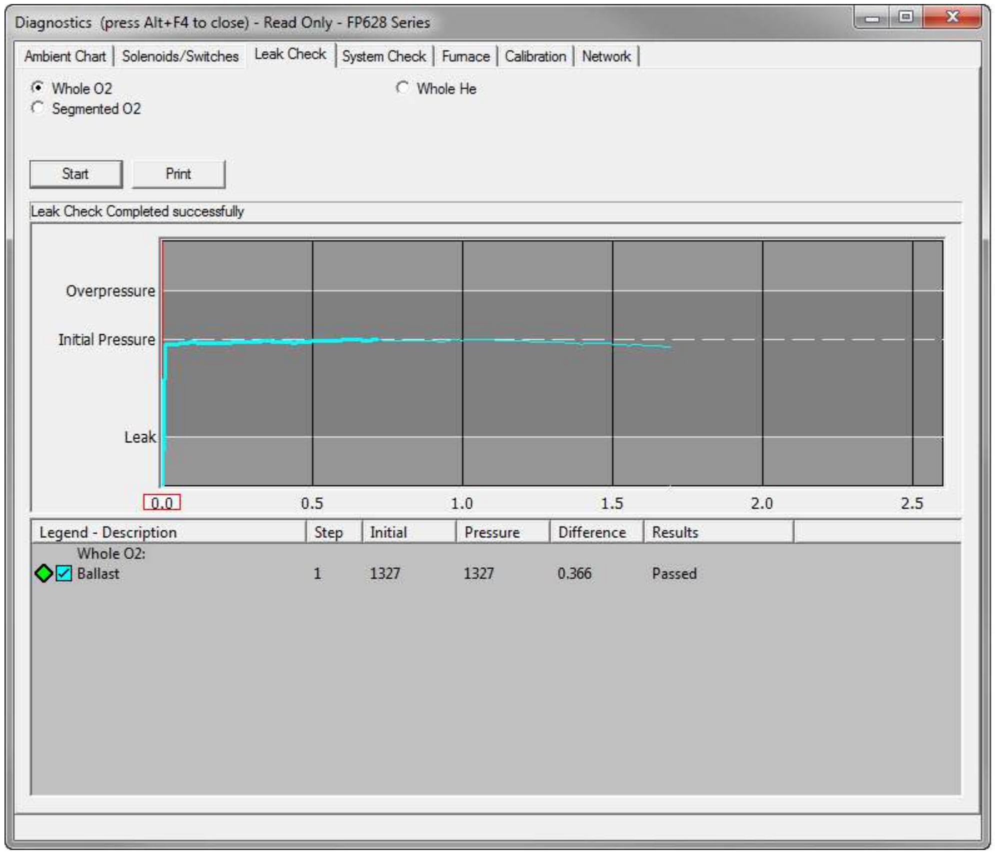
Performing a Leak Check

There are two leak checks: a whole system leak check and a segmented system leak check. As its name implies, the segmented leak check isolates small sections of the system and tests them individually. When performing a leak check, first perform a whole system check and determine if the systems passes. If it does, STOP there; it is not necessary to continue with the segmented test. If the whole system leak check does not pass, then perform a segmented test. By isolating sections of the system, you can determine which section is leaking and concentrate your service efforts in that area.

It is possible for the whole system leak check to pass and a segmented leak check to fail. The whole system has a greater volume than the isolated systems. Because of this, a small leak to the whole system leak check looks like a large leak to an isolated segment leak check. As long as the whole system leak check passes, the instrument is operating properly and is capable of producing excellent results.

NOTE Refer to Leak Check Definitions, page 8–21, and Leak Check Legend Symbols, page 8–21, for additional information.

1. Select Diagnostics and select Leak Check. The Leak Check screen will appear.



2. Select a button in the upper left of the screen to select the leak check procedure to perform. Only one procedure can be selected at a time.
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

NOTE Refer to the Leak Check Flow Diagrams, page 8–23, to determine where each system, listed as follows, is located in the instrument.

Whole Oxygen—Select this button to pressurize and leak check the entire combustion system.

Whole Helium or Whole Argon—Select this button to pressurize and leak check the entire measurement system.

NOTE The Segmented Oxygen consists of three different sections: Combustion, Ballast, and IR Cells.

Segmented Oxygen—Select this button to pressurize and leak check the combustion system. The combustion system will be leak checked in three steps.

He Aliquot Loop or Ar Aliquot Loop—Select this button to pressurize and leak check the measurement system. The measurement system will be leak checked in two steps.

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 mm Hg above initial pressure. If the pressure rises above this value, the leak check will fail.

Leak (graph)—Leak pressure is approximately 5 mm Hg below initial pressure. If the pressure falls below this value, the leak check will fail.

Leak Check Legend Symbols

Under Legend on the leak check screen are two columns of symbols.

The first column represents the measurement transducer. After the test is complete, the color of the symbol represents test results.

The second column represents test progress. Before the test starts, the box is empty: no color. As soon as the test starts, the box is filled with a color. After the test is complete, a check mark appears in the box.

 Combustion Pressure Transducer symbol. After the leak check is finished, the color indicates the test result.

Green—The leak check passed.

Red—The leak check failed. Decrease in system pressure. An X will appear over the symbol.

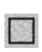
Yellow—The leak check failed. Increase in system pressure.

 Ballast Pressure Transducer symbol. After the leak check is finished, the color indicates the test result.

Green—The leak check passed.

Red—The leak check failed. Decrease in system pressure. An X will appear over the symbol.

Yellow—The leak check failed. Increase in system pressure.

 This symbol indicates leak check progress. No color indicates leak check is not started.

 This symbol indicates leak check progress. Color indicates leak check has started.

 This symbol indicates leak check progress. A check mark indicates that the leak check has finished.

Leak Check Flow Diagrams

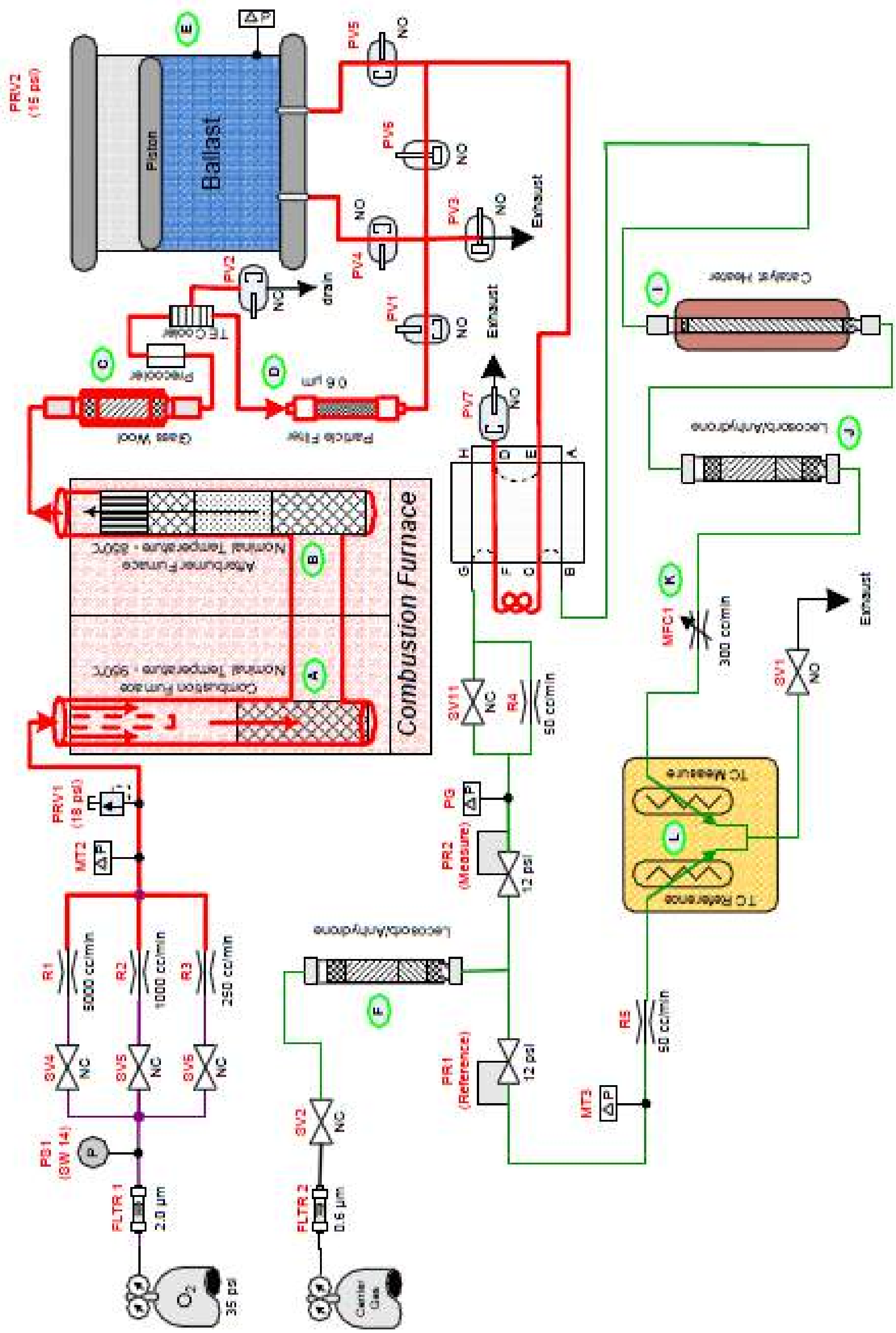


Figure 8-1
Oxygen Leak Check Flow Diagram

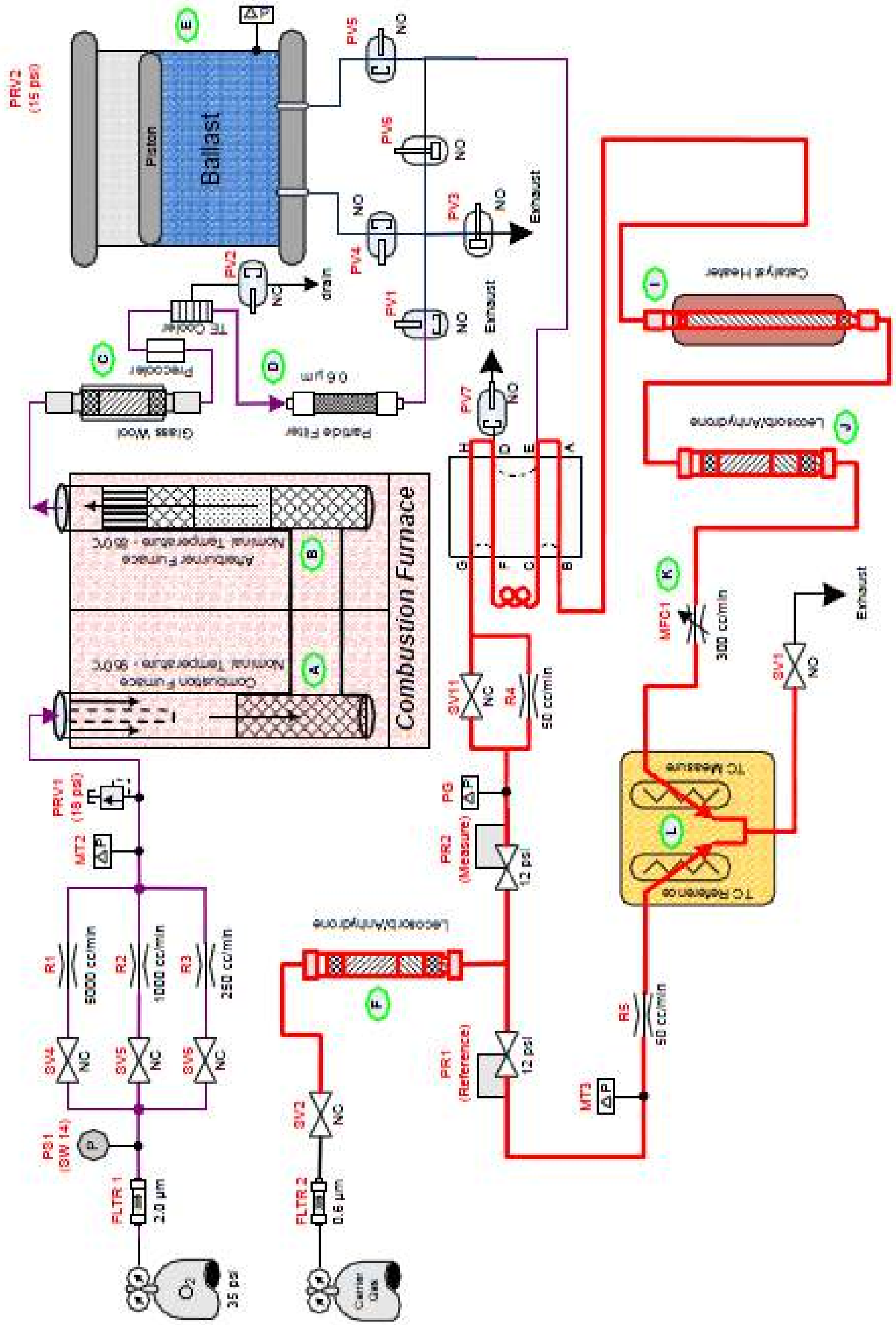


Figure 8-2
Carrier Gas Leak Check Flow Diagram

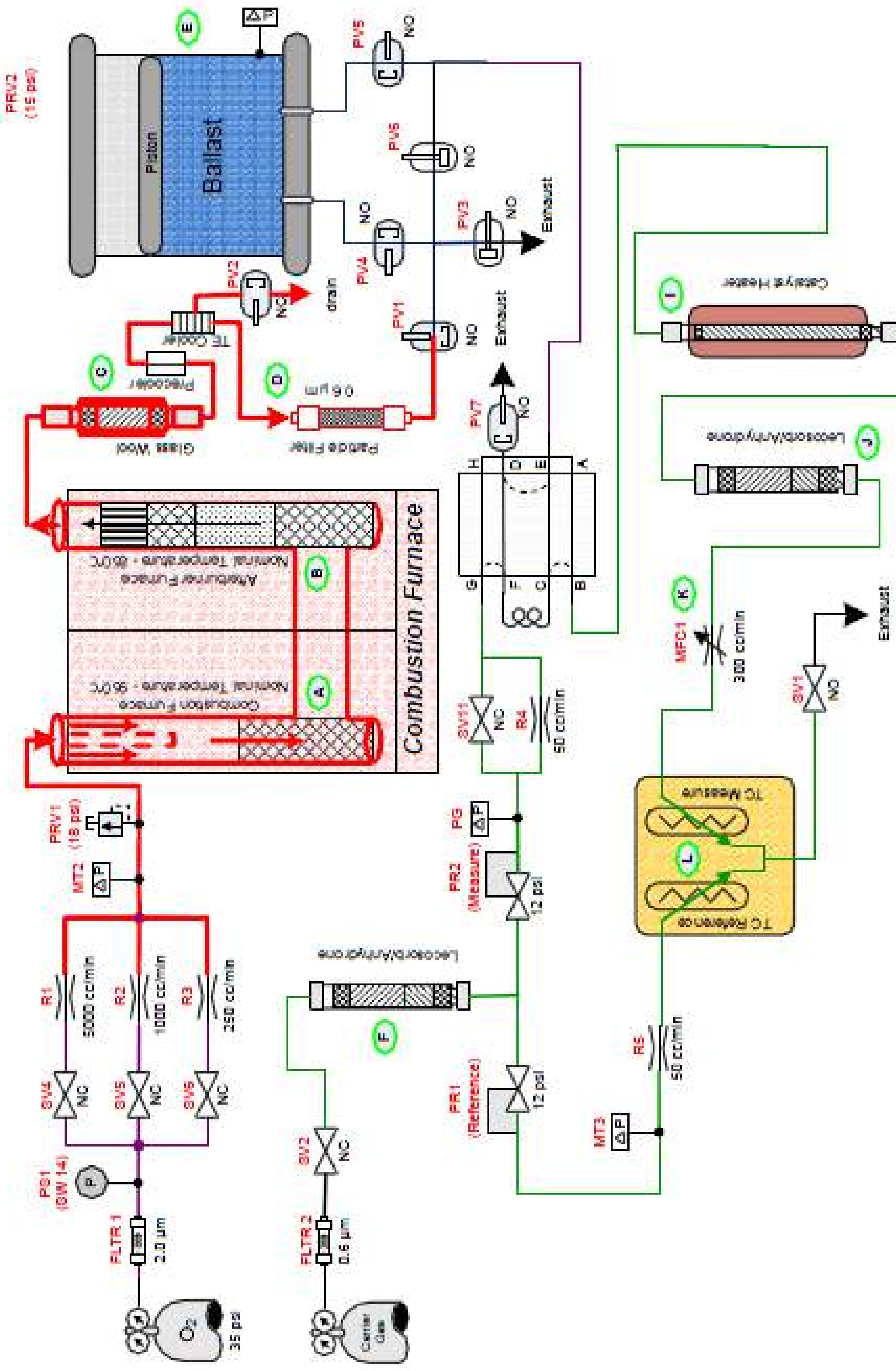


Figure 8-3
Oxygen Furnace Leak Check Diagram

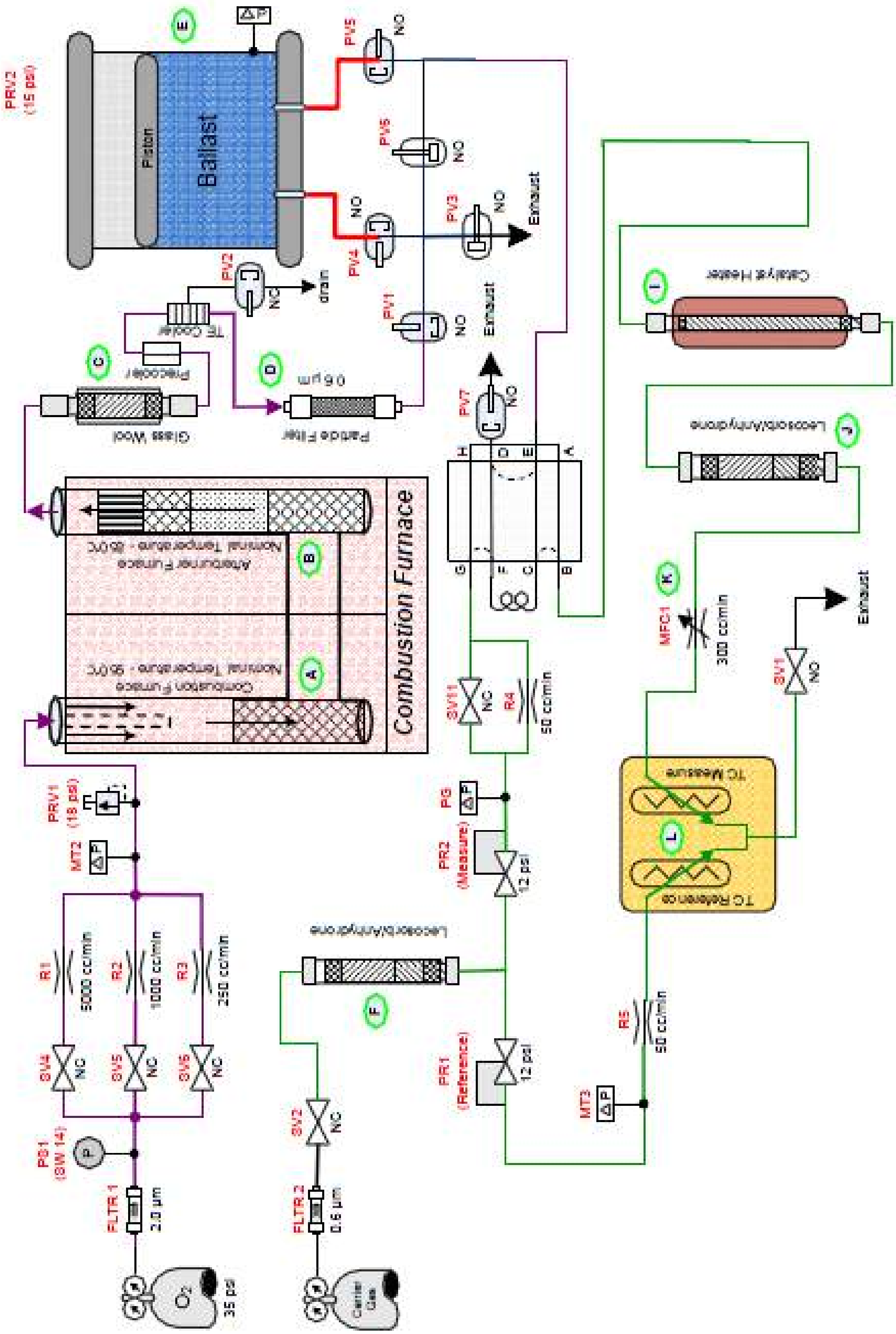


Figure 8-4
Ballast Leak Check Diagram

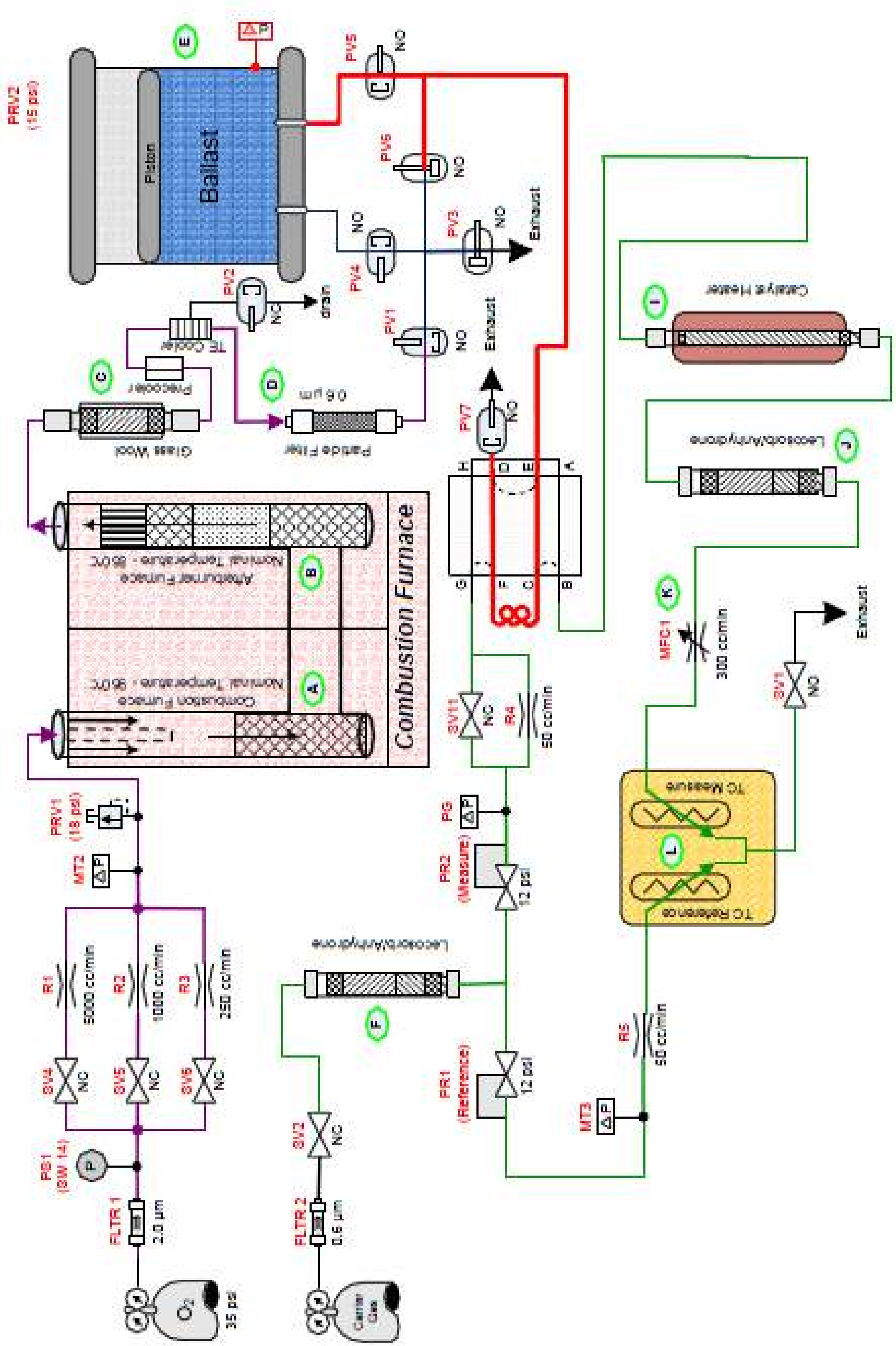


Figure 8-5
Aliquot Doser Leak Check Diagram

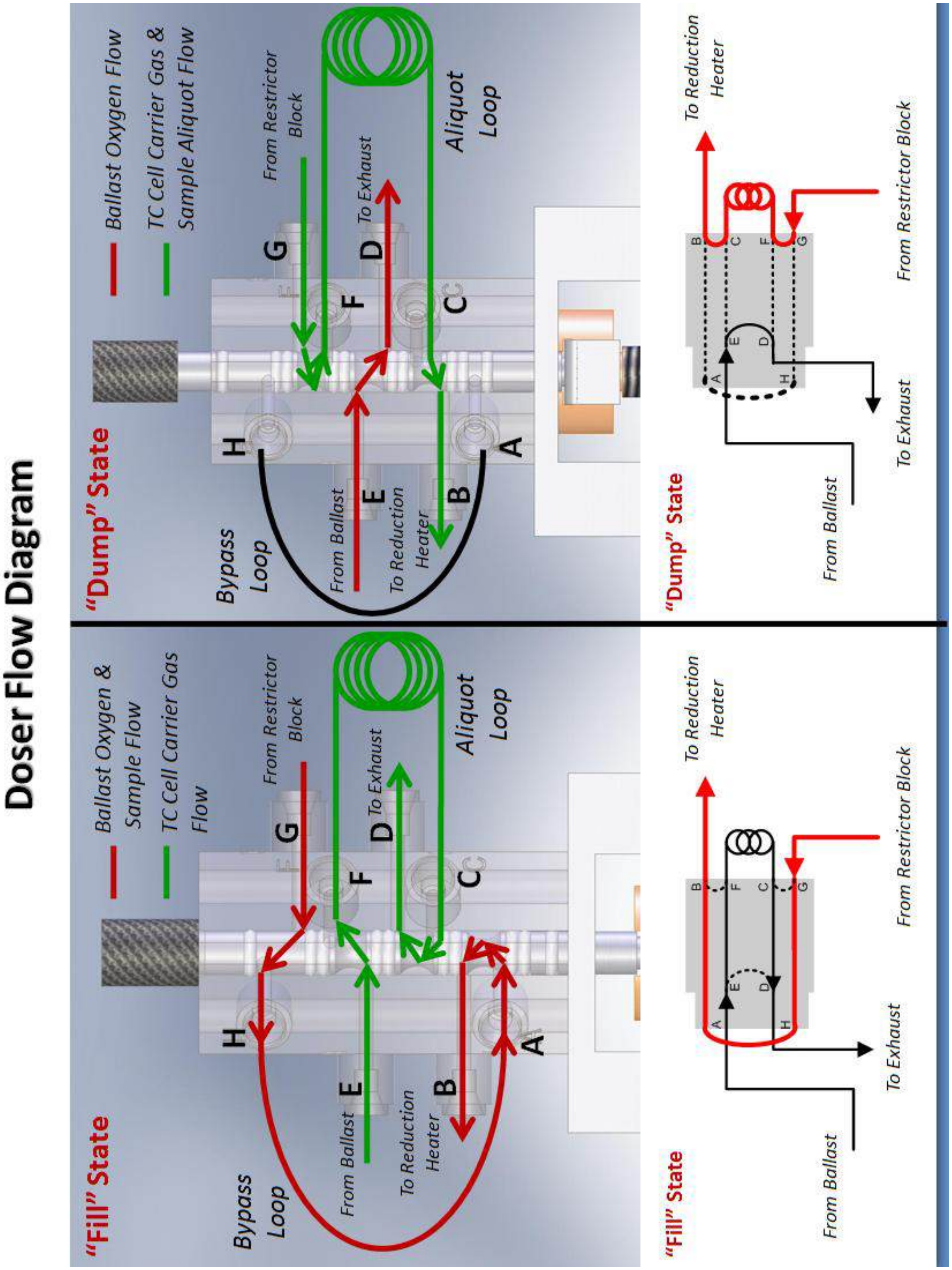


Figure 8-6
Carrier Gas Aliquot Doser Leak Check Diagram

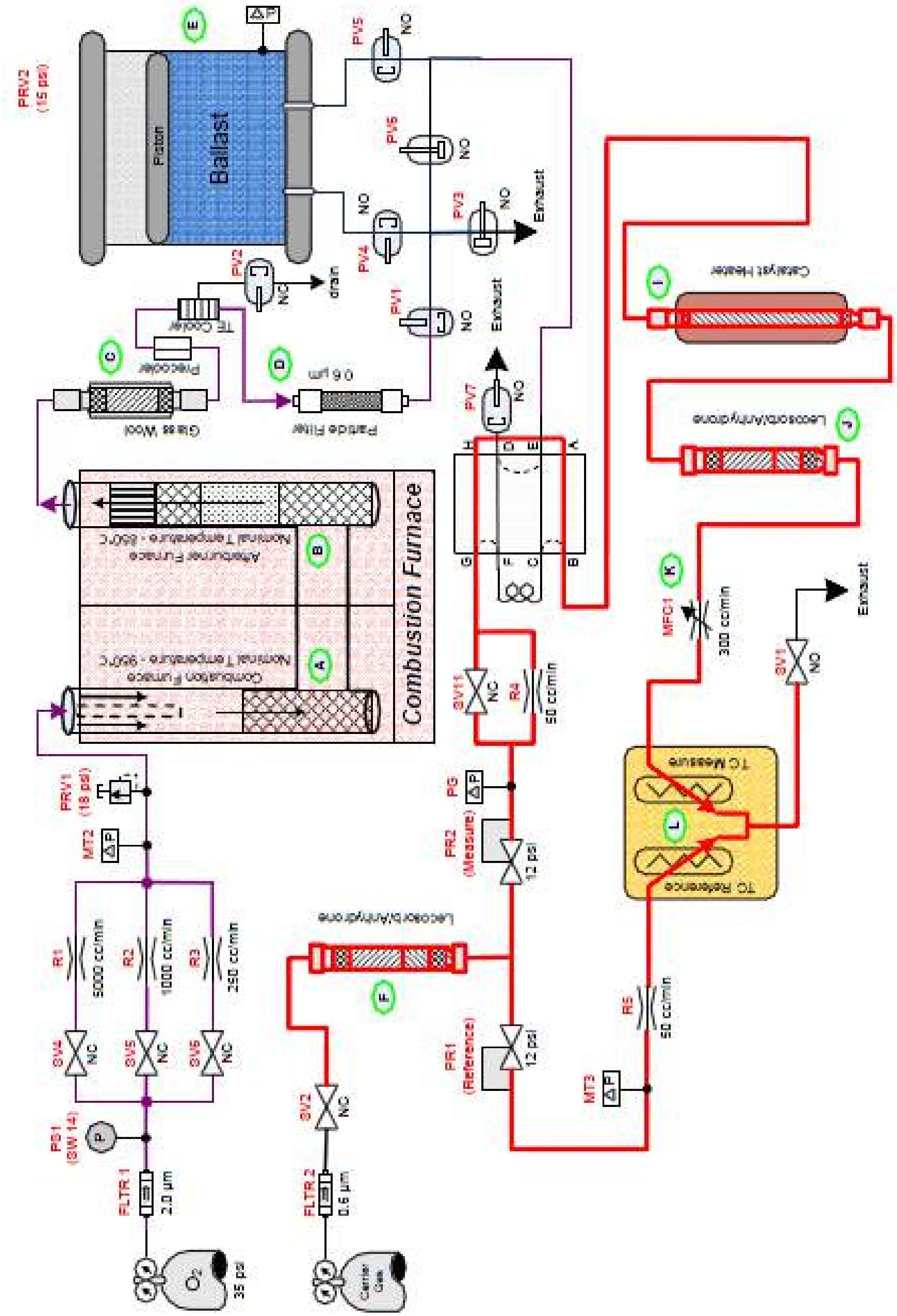


Figure 8-7
Carrier Gas Aliquot Bypass Doser Leak Check Diagram

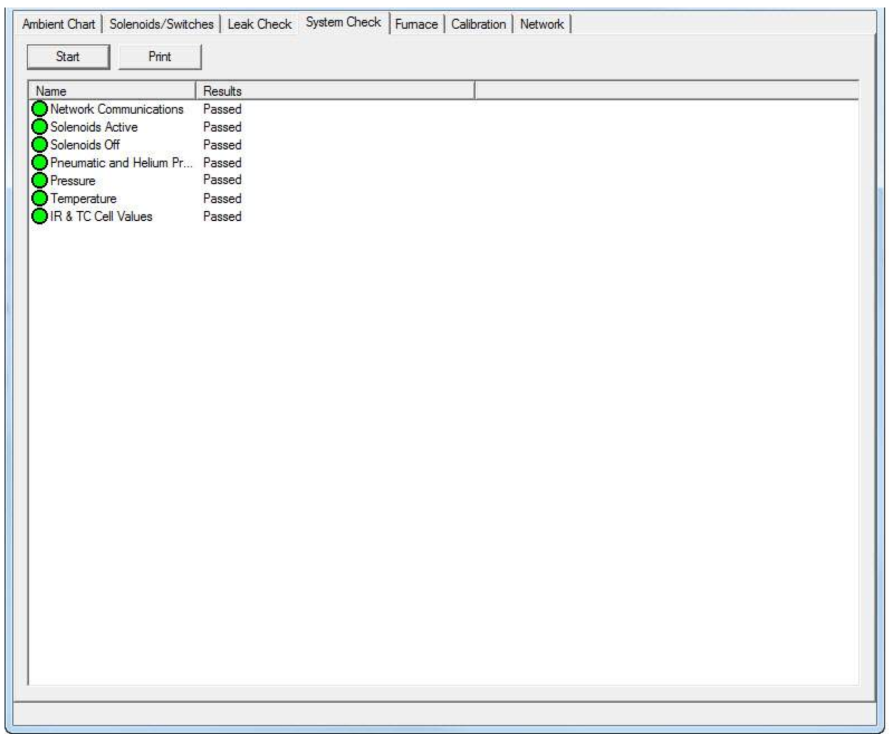
System Check

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 8–31.

1. Select Diagnostics and 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 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 8–13, for additional 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 8–32, 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 8–32, to check each solenoid valves individually.

Pneumatic and Carrier Gas Pressure—Checks the incoming pneumatic and carrier gas pressures to determine if they have been turned on and set to the proper value. If this check fails, check the pneumatic and carrier 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.
- Carrier Gas Pressure Range—10 to 14.5 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.
- Ballast Pressure Range—700 to 780 mm Hg.

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.

- TE Cooler Temperature Range—2°C to 10°C.
- Ballast Temperature Range—45°C ±0.5°C
- Combustion Furnace, Afterburner Furnace, Reduction Heater Temperature Range—±10% of setpoint.

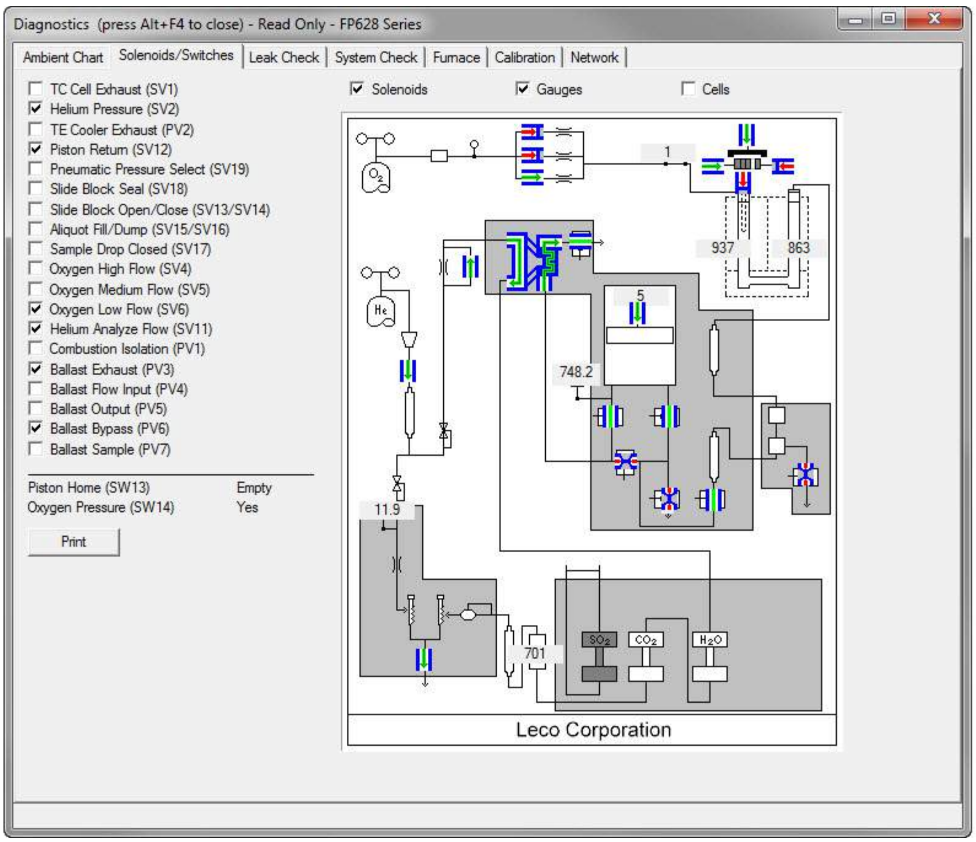
IR and TC Cell Values—Checks the IR and TC cell output voltages to determine if they are in the proper range. Refer to Ambient Monitor Definitions, page 8–6, for more information. If any voltage falls outside the range listed as follows, the test will fail.

- 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 technician 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 FP628 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 still experience difficulties after referencing the service information, please contact the LECO Service Department at 269-982-5497 for assistance.

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 9–13, Configuring Firewall Settings, page 9–22, and Registering Software, page 9–27.

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.

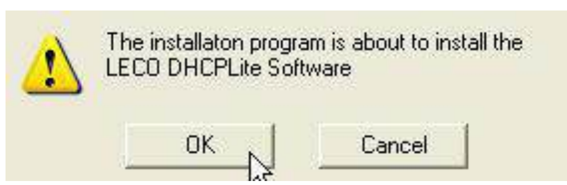
Software Installation Procedure

NOTES

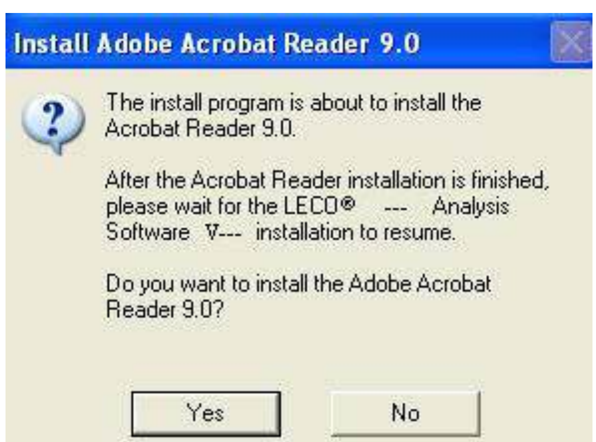
- The software must be started at least once on the administrative level as the software must be able to access and modify the registry.

- Do not install the Copy Protection Key until after the software has been installed.

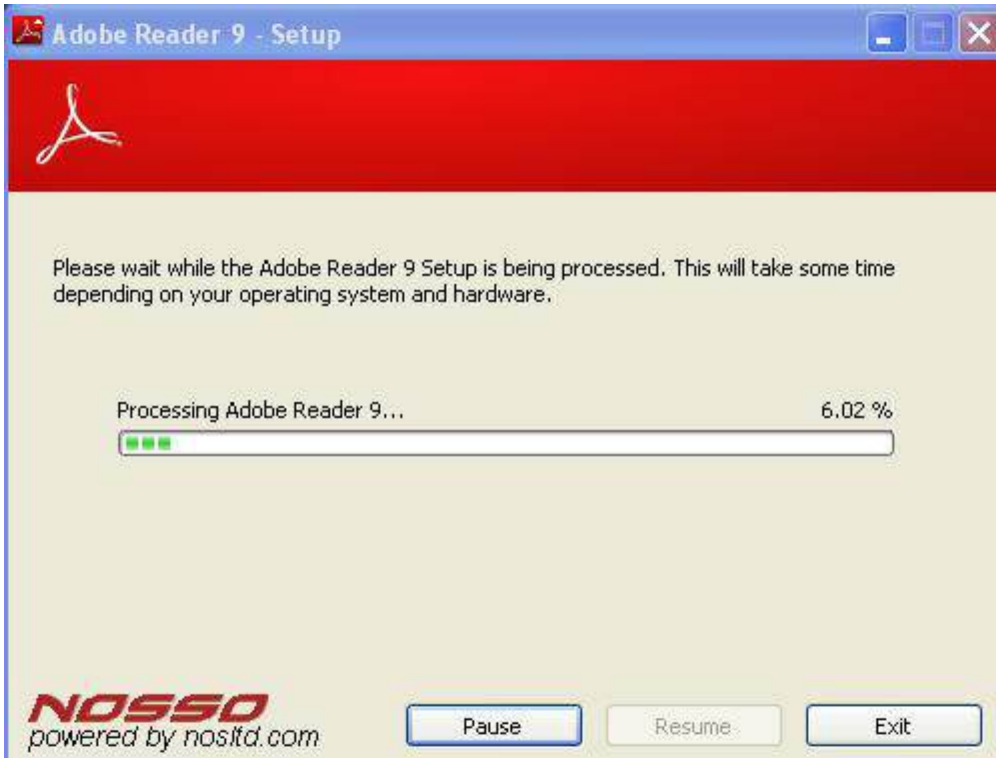
1. Verify that the instrument is turned Off.
2. Turn On the computer tower.
3. Install the communications cable (typically Ethernet or USB) as appropriate for the instrument.
4. For an Ethernet connection, configure the Ethernet adapter. Refer to Configuring the Ethernet Adapter, page 9–13.
5. Log in 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.

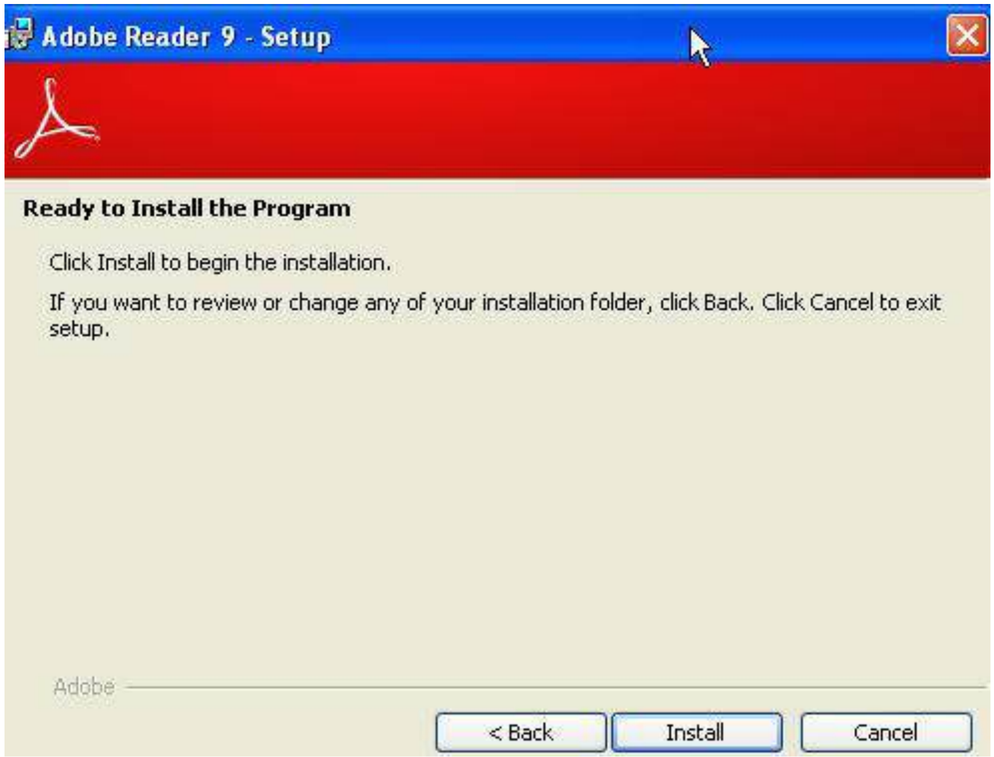


9. Select Yes. The following message box will appear to indicate *Adobe Reader* is preparing for installation.

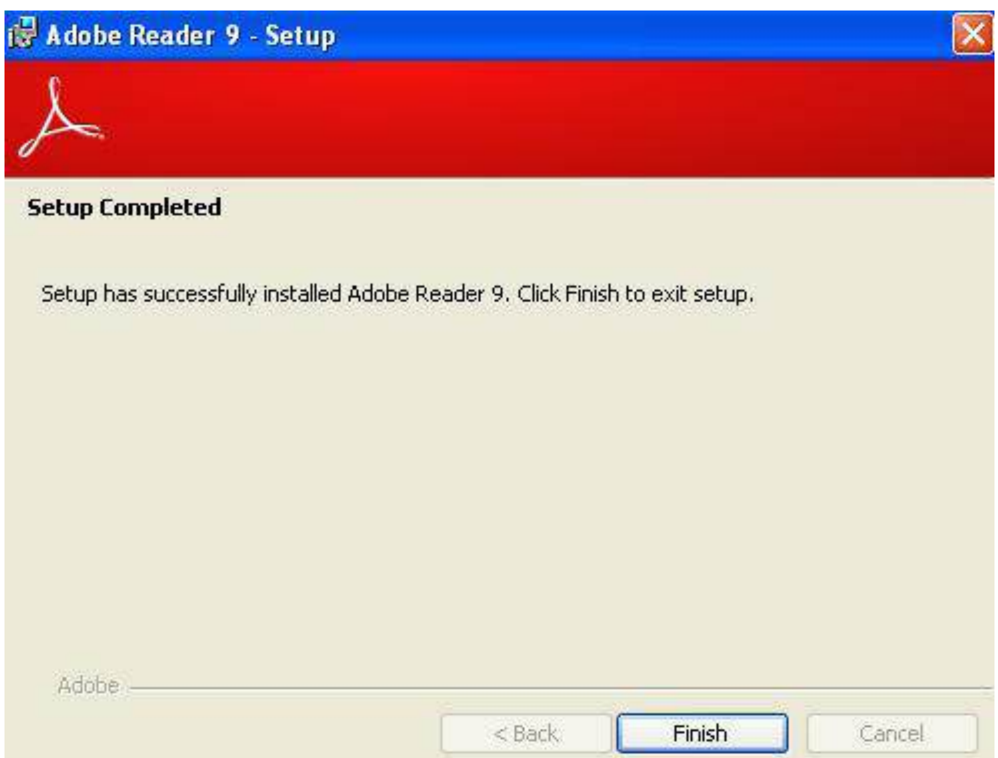


10. Determine the folder location for *Adobe Reader*. Select Next for the default location, or select Browse, select a different location, and then select Next.

11. When the "Ready to Install Program" dialog box appears, select Install.



12. When the "Setup Completed" dialog box appears, select Finish.



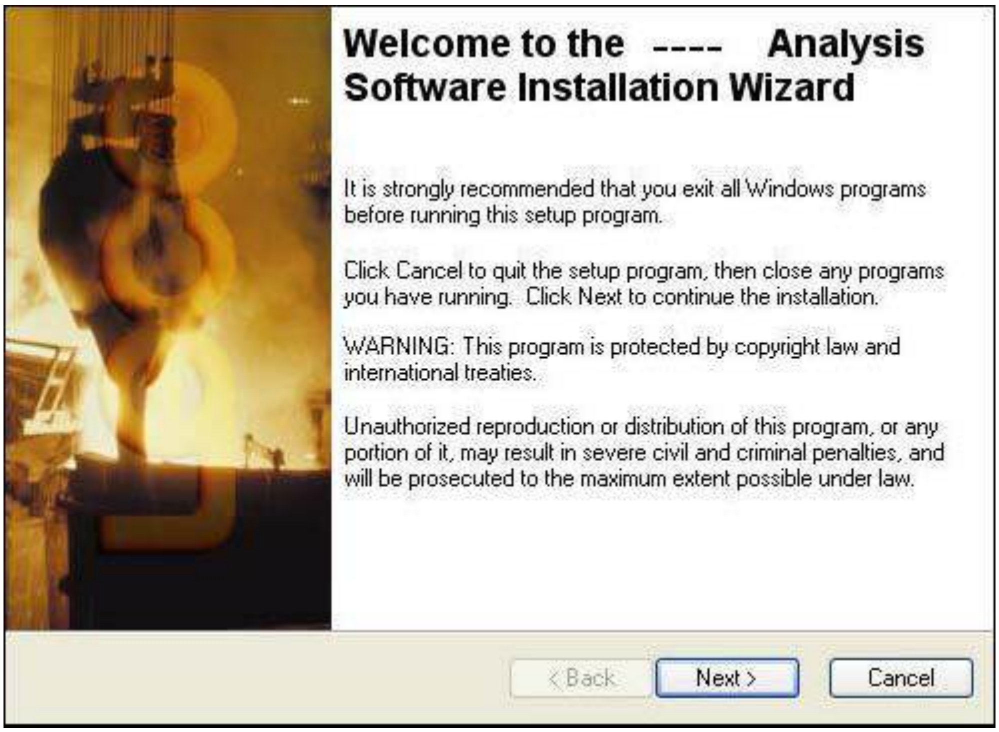
13. If the instrument software Welcome dialog box does not appear:

    A. Select the Start button in the lower left-hand corner.

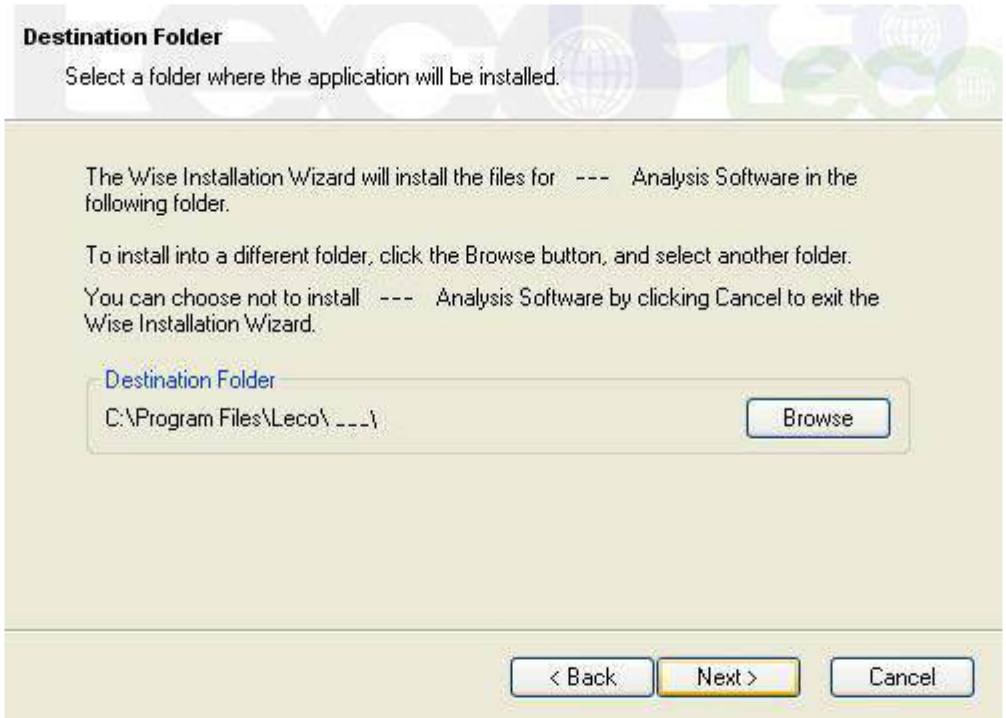
    B. Select Run. The Run dialog box is displayed.

    C. 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.)

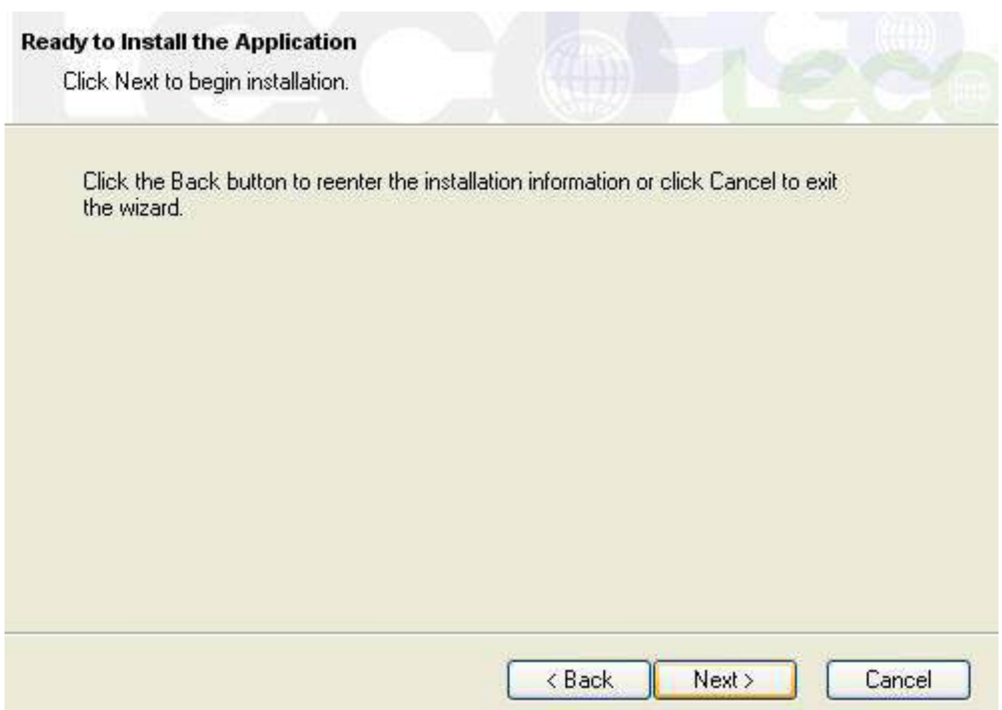
14. At the instrument software Welcome dialog box, select Next.



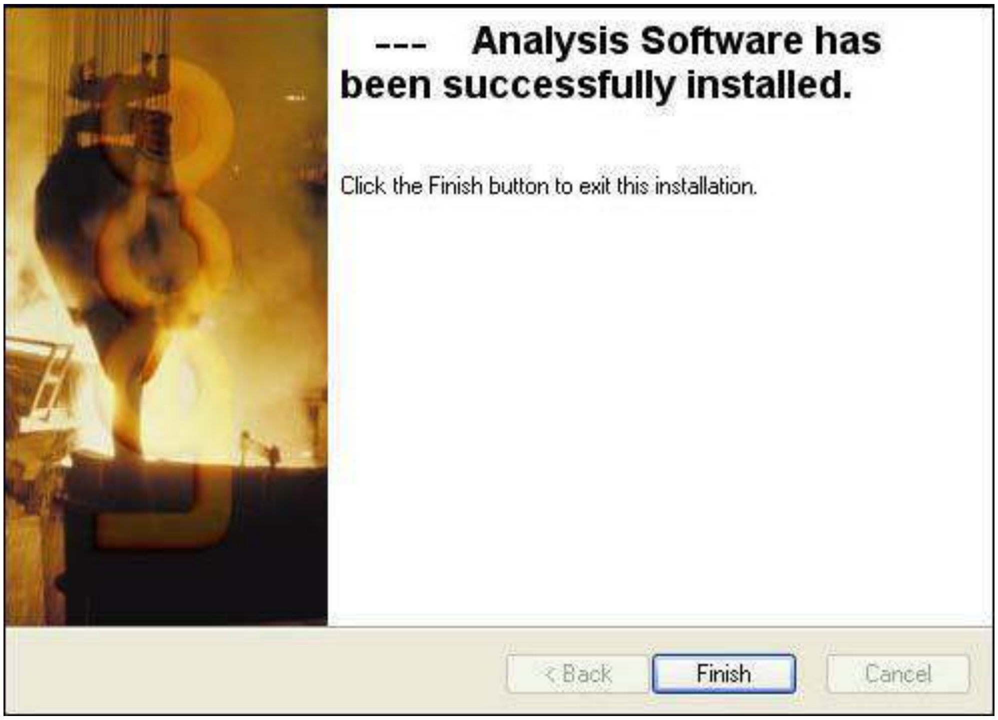
15. Determine the folder location for the software. Select Next for the default location, or select Browse, select a different location, and then select Next.



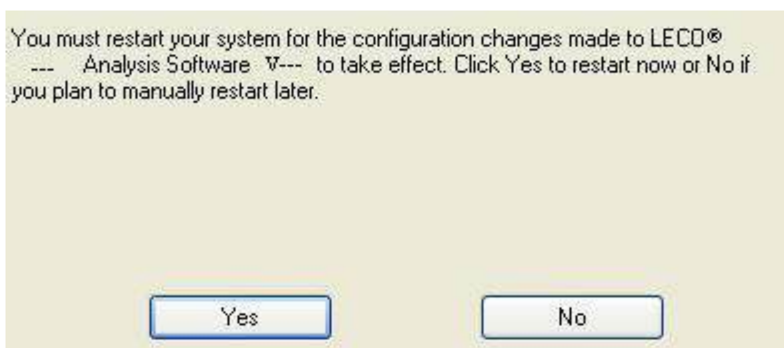
16. Select Next to install the software.



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 9–27.

Configuring the Ethernet Adapter

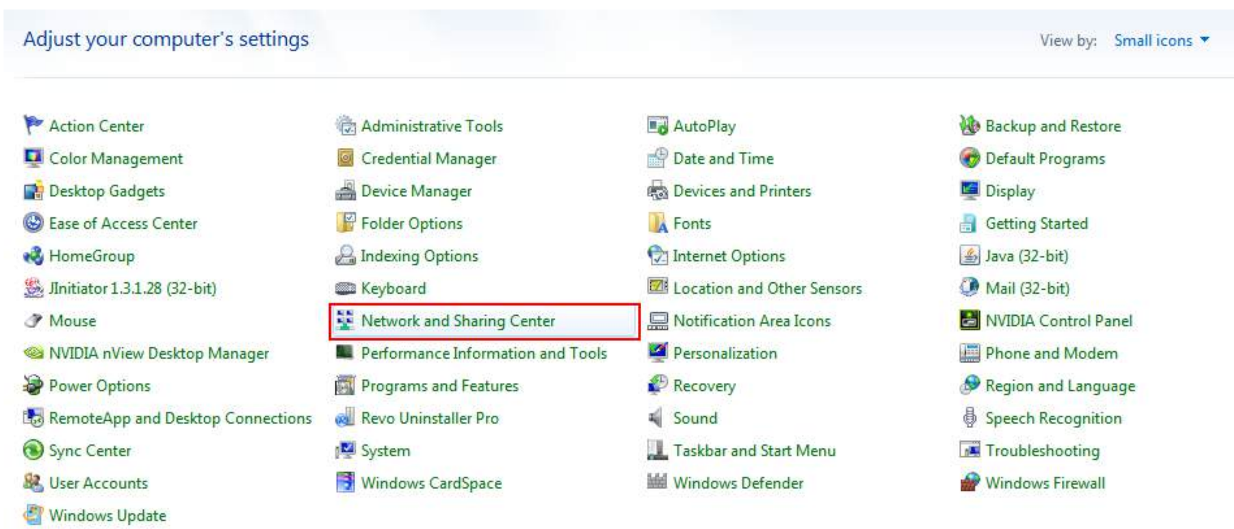
The following procedure is necessary for the proper operation of the software with a Copy Protection Key and applies for computer systems that are not supplied by LECO. For computers supplied by LECO, this configuration has already been completed.

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.)

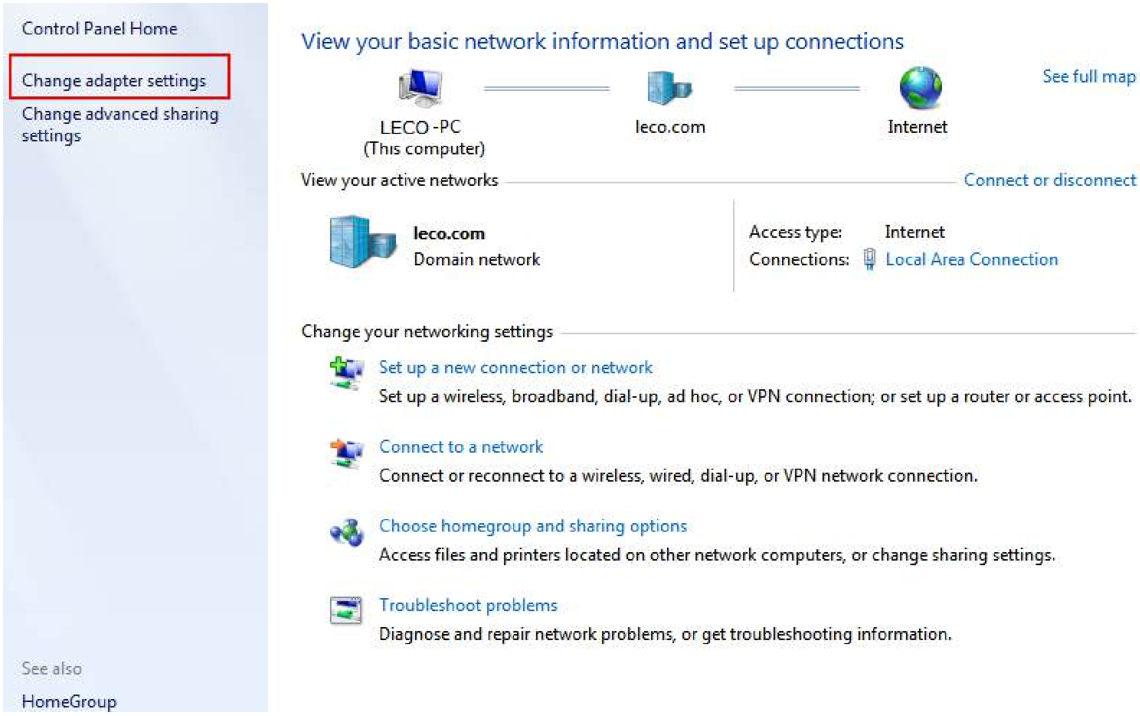
Windows 7

The following steps apply when using the *Windows* 7 operating system.

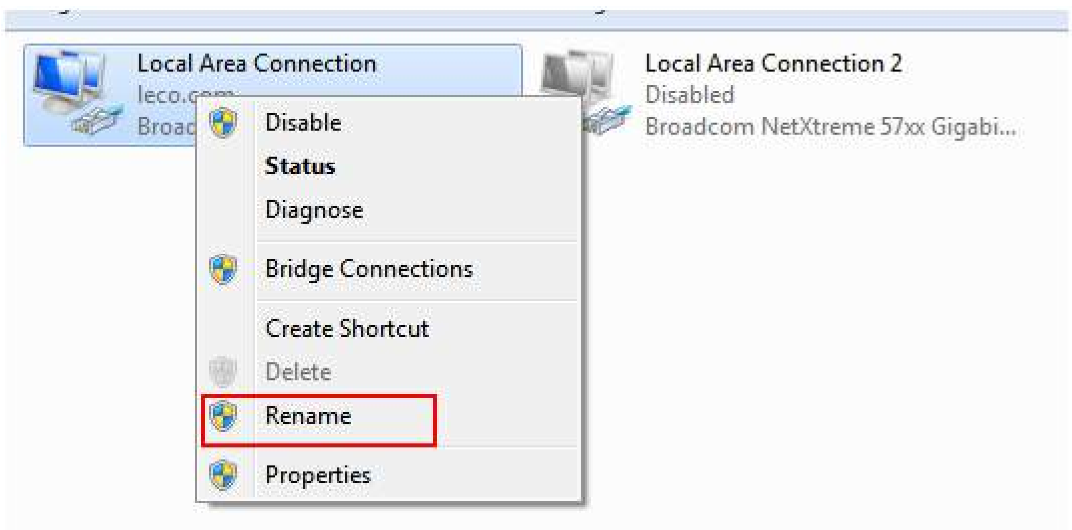
1. Select  the *Windows* desktop and then select Control Panel.
2. Select Network and Sharing.



3. Select Change Adapter Settings.

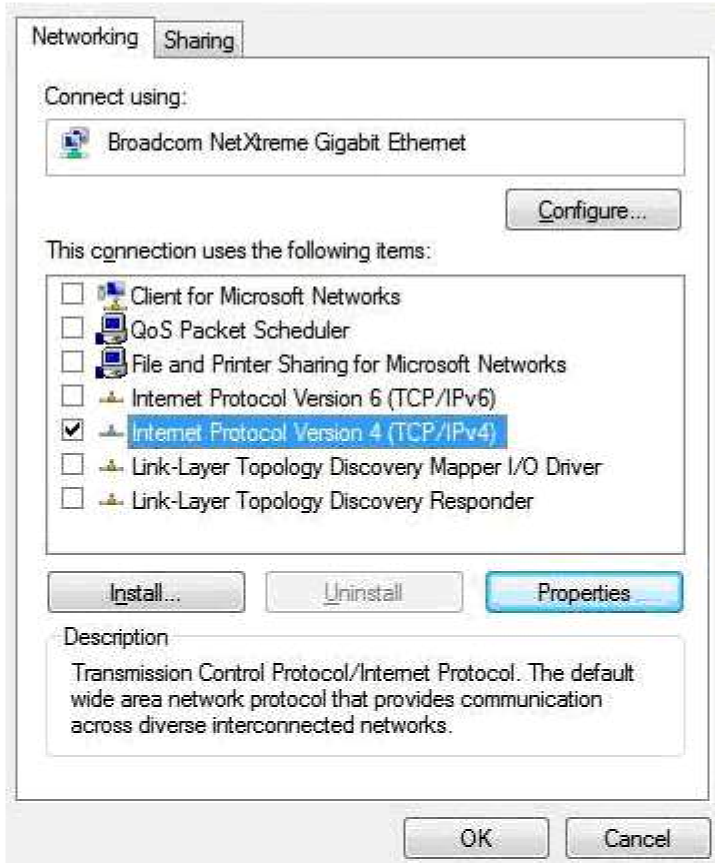


4. Right-click on the name of the connection for the instrument and rename it to LECO Hardware.

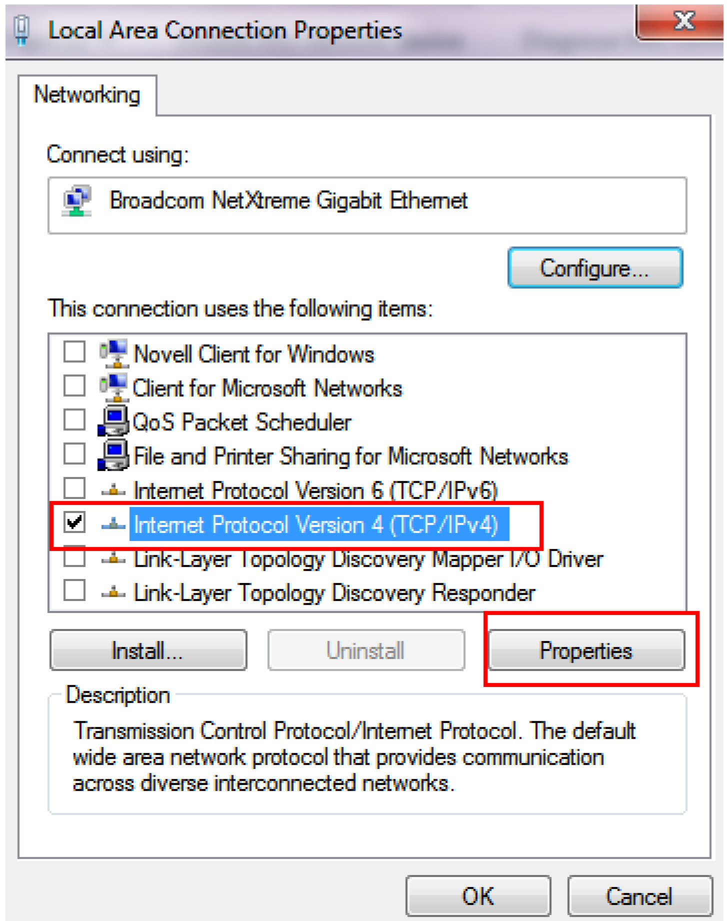


5. Right-click and select Properties.

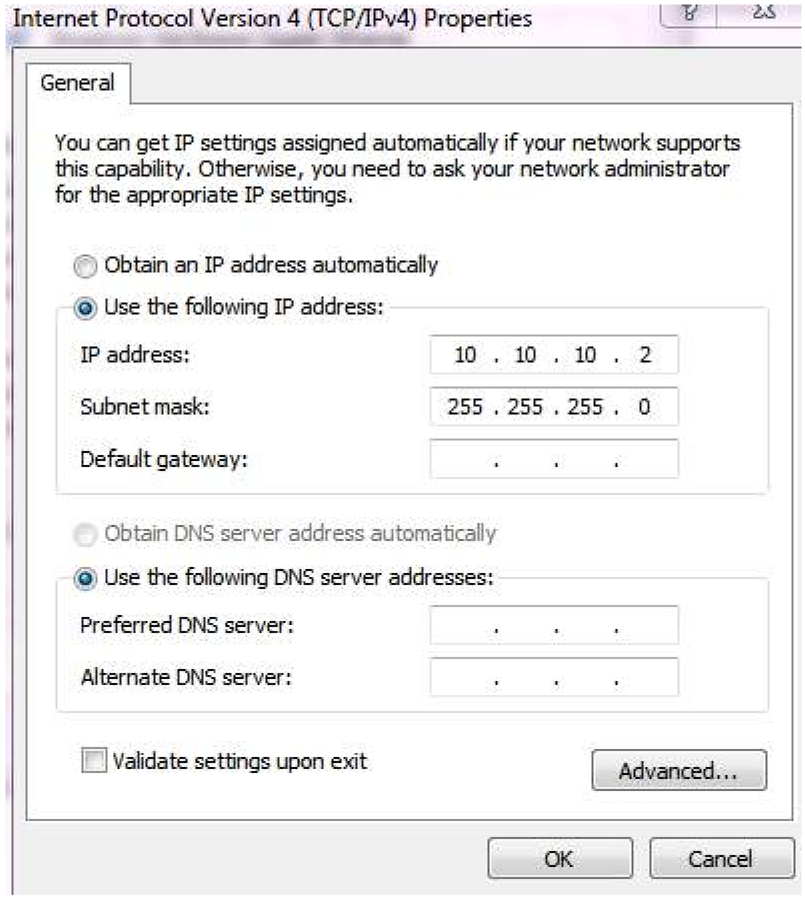
6. Clear all of the checkboxes except Internet Protocol Version 4 (TCP/IPv4).



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.



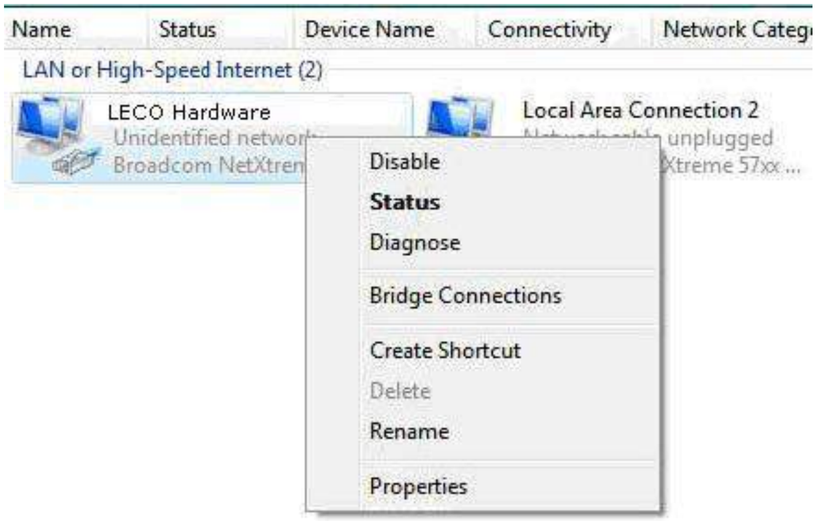
9. Select OK.

Windows Vista

The following steps apply when using the *Windows* Vista operating system.

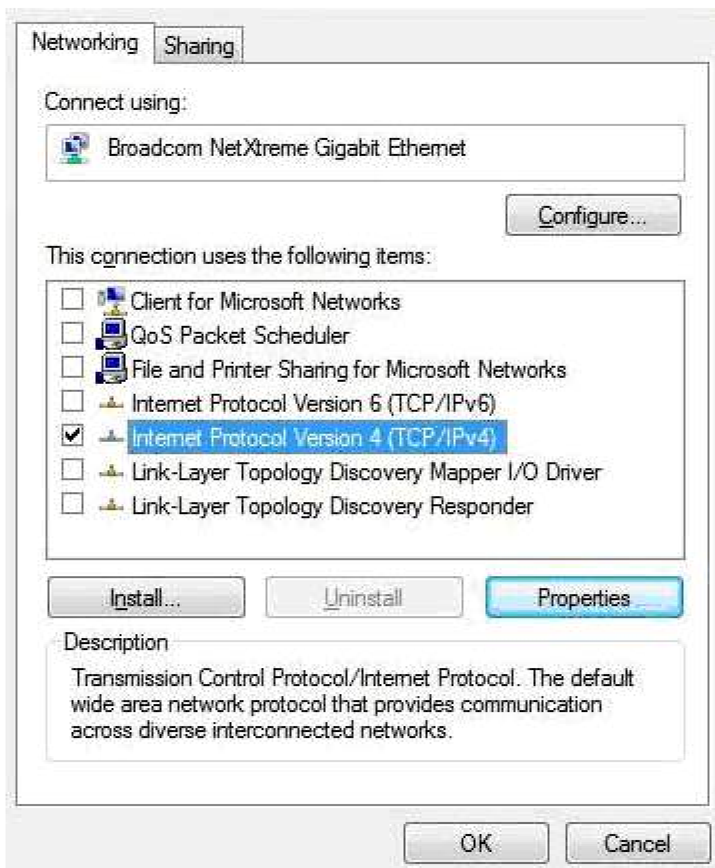
1. Select the *Windows* desktop.
2. From the Start Menu, select Control Panel.
3. From the Control Panel, select Network and Internet, select Network and Sharing, and then select Manage Network Connections.
4. On the Manage Network Connections tab, select the connection that will be used for the instrument.

5. Select the name of the connection and rename it to LECO Hardware.



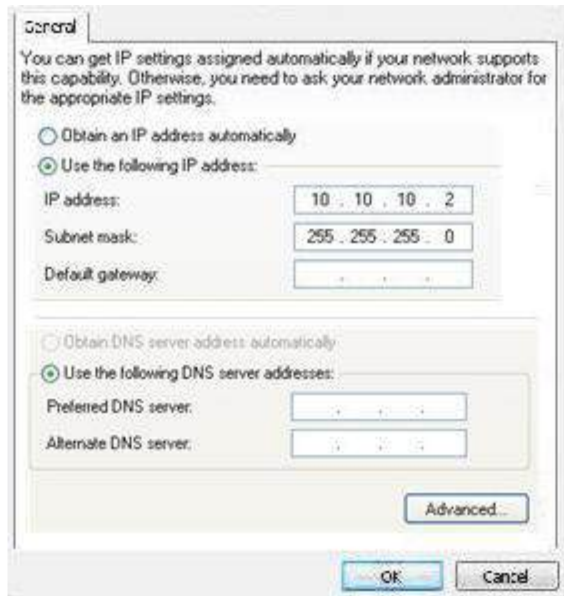
6. Right-click and select Properties.

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.

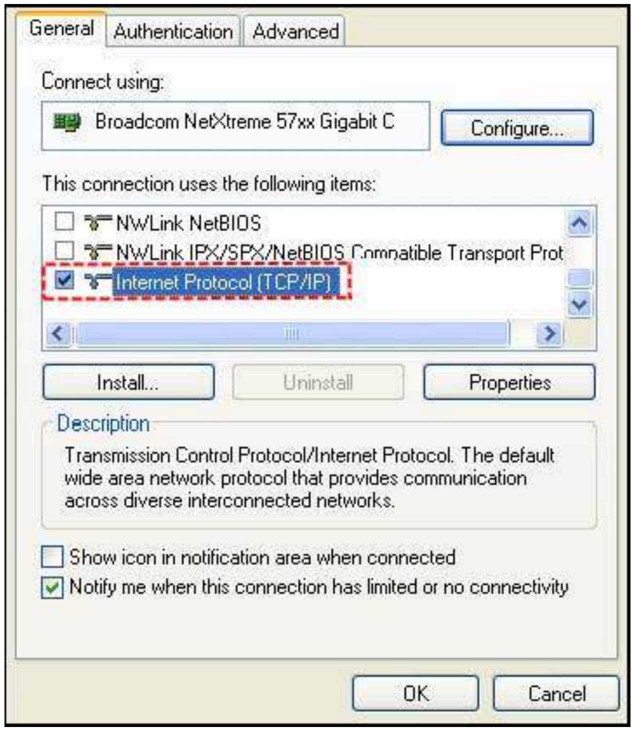


Windows XP

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.

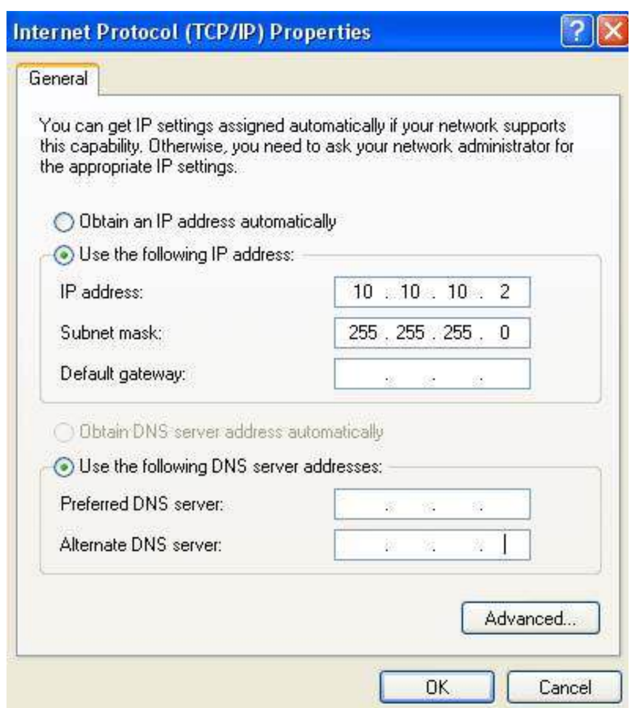
2. If a network connection is not installed, install an Ethernet adapter. Refer to the instructions supplied with the Ethernet adapter for installation procedures.
3. Once the Ethernet adapter is installed, and with the computer On, select Start, Settings, Control Panel, and then double-click on Network 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

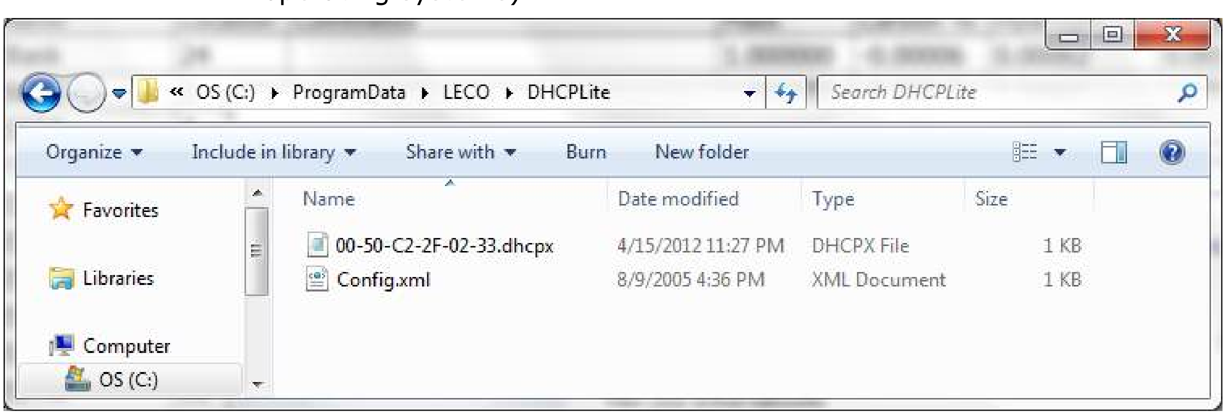
The PC that controls the LECO instrument(s) has a network board dedicated to communicating with the LECO instrument(s). A unique IP address is assigned to that board. Unique IP addresses are also assigned to each LECO instrument connected to the PC. (One IP for the PC board and a different IP for each 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 9–25.
- 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.

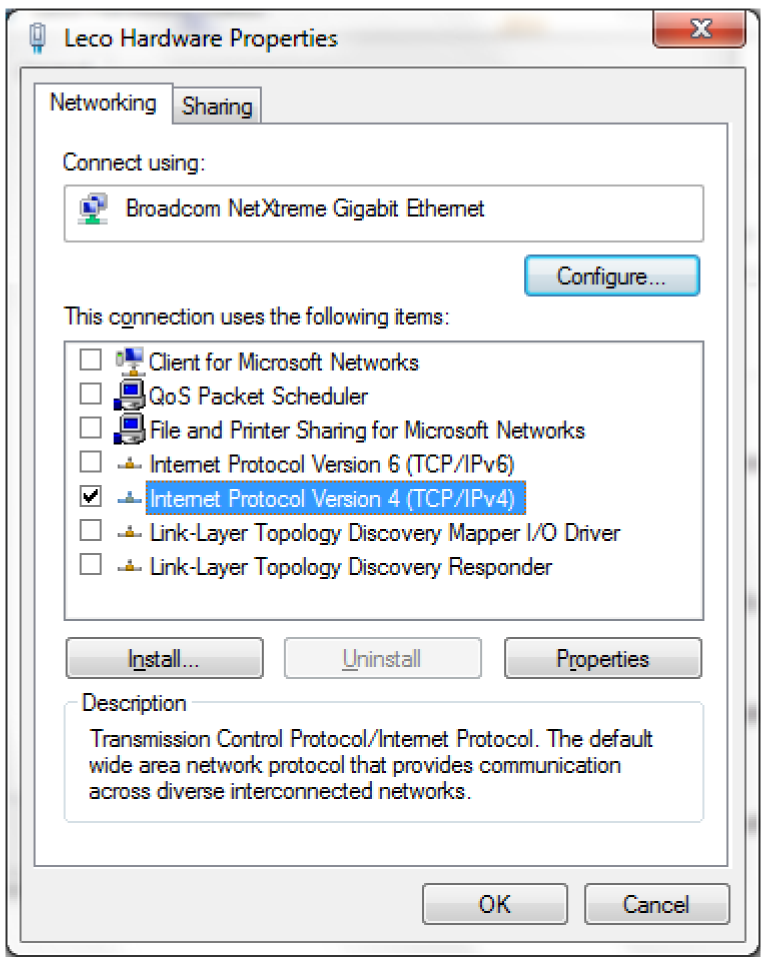
3. Select Administrative Tools.
4. Open the Services status window.
5. Restart the "DHCPLite" Service.
6. Start the LECO instrument software.

Changing the IP Address for LECO Instruments in *Windows*

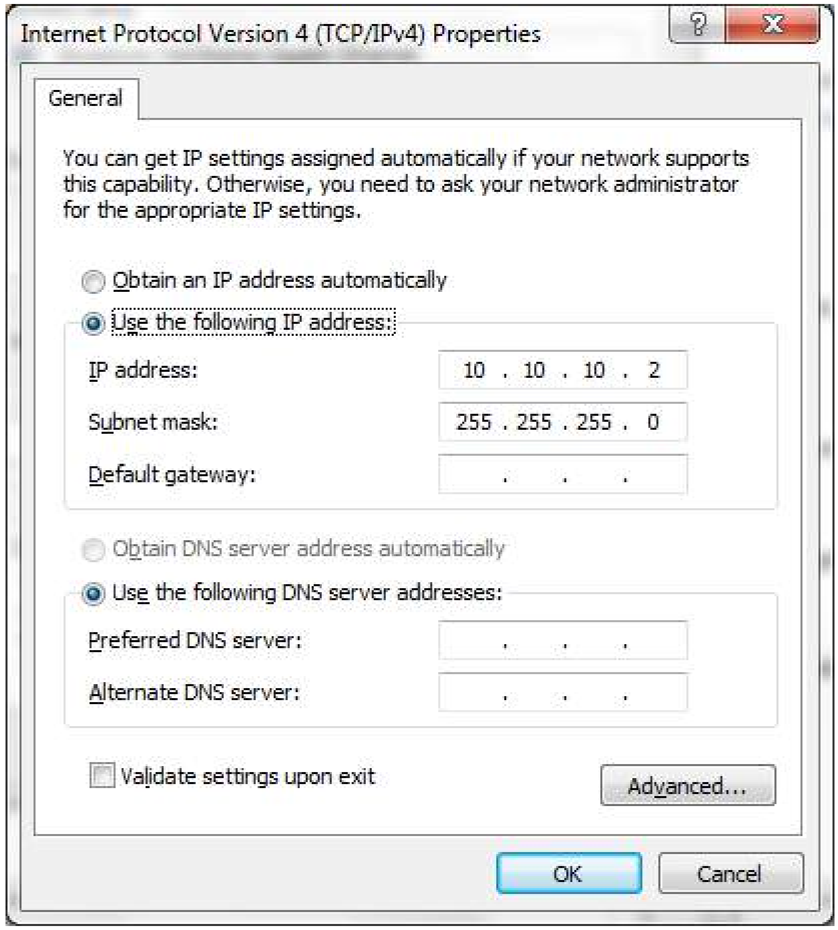
1. Select  the *Windows* desktop and then select Control Panel.
2. Select Network and Sharing Center.
3. Select the LECO Hardware connection to open it.

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

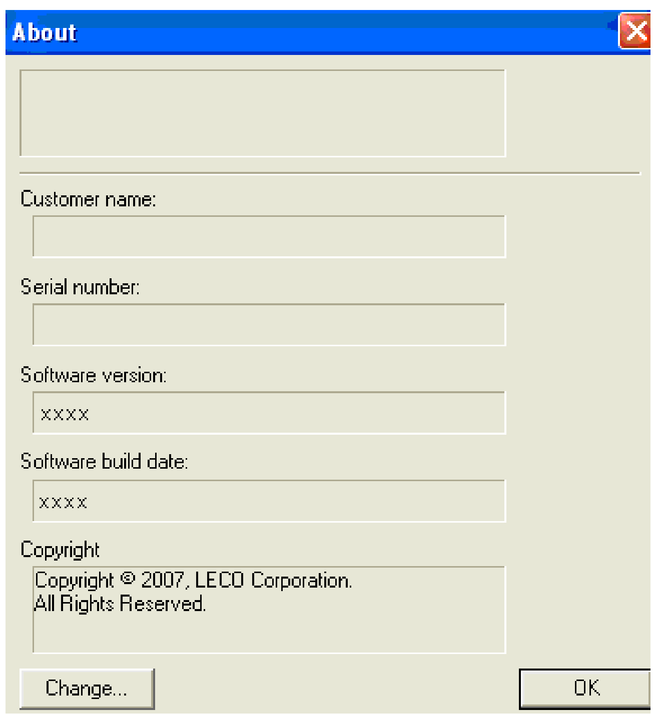
To register software for a new instrument and PC from LECO, insert the copy protection key into a USB port. Refer to Troubleshooting Copy Protection Key, page 9–33, for further information.

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 9–29, and contact LECO Service for further information about registering the instrument.

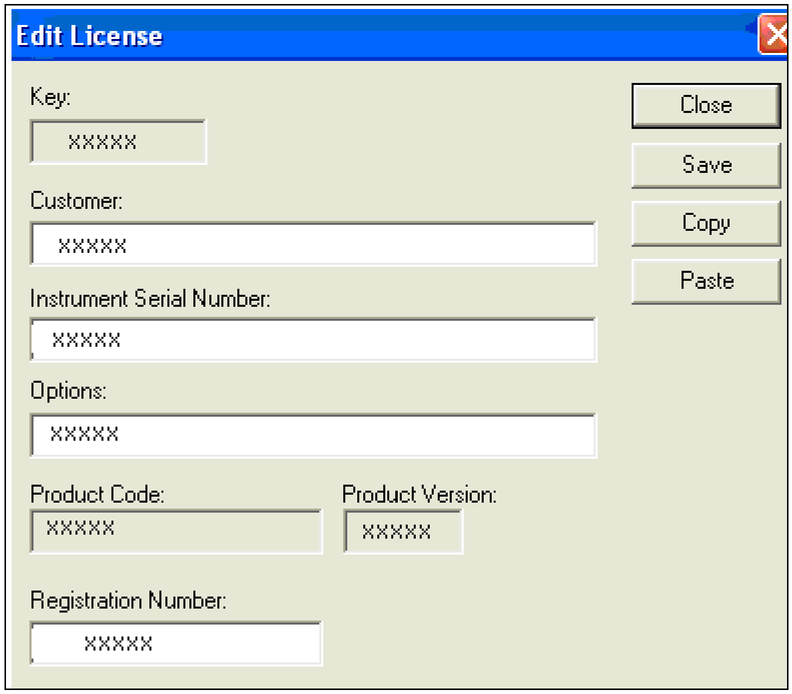
CAUTION

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.

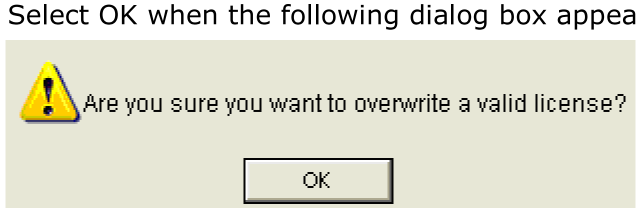
<base64>
58
D7IJxwMAvPoSTEVDTyBEb2N1bWVudGF0aW9u1pBOAQ1HQ3hHQyBTY3JpcHRzAA1j
ZW8ydmd1dGuIEw==
</base64>

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:



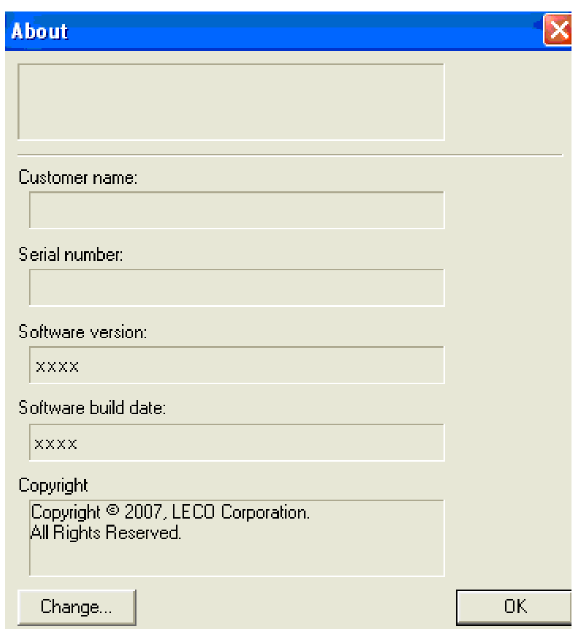
Troubleshooting Software Registration

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.

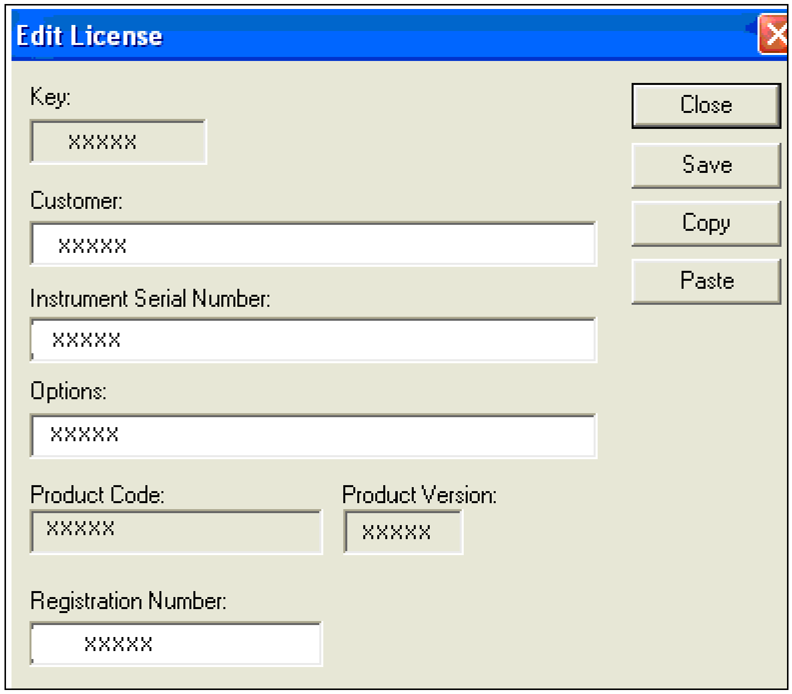
Submitting Registration Information to LECO

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.



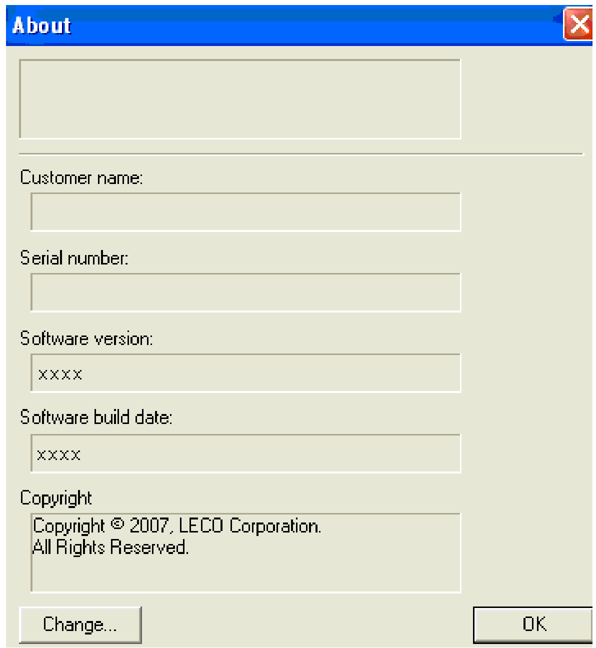
4. Select Copy.

5. Open a blank email message and press Ctrl and V on the keyboard to paste the license information into the email message.

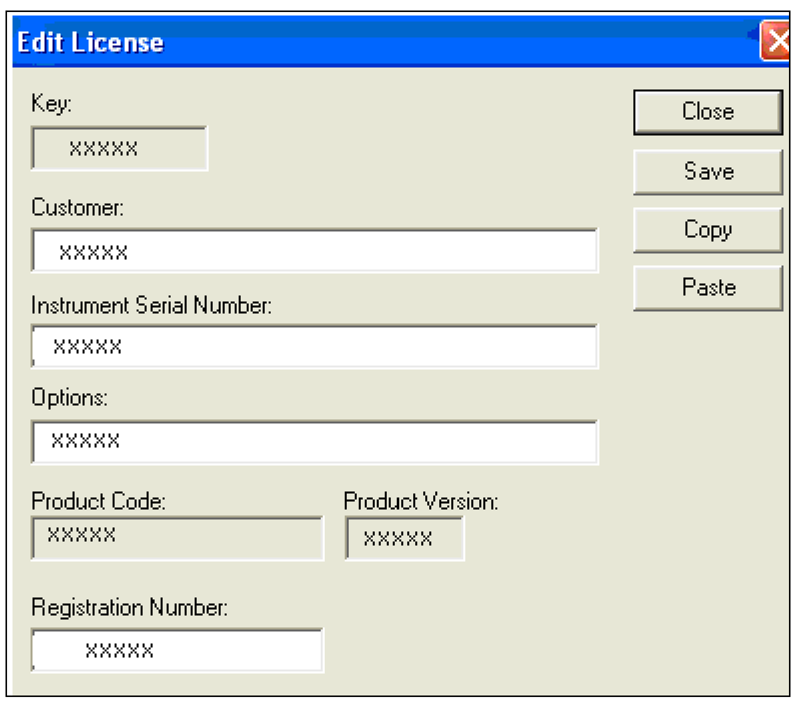
6. Send the email or just the Key number to the LECO designee.

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.

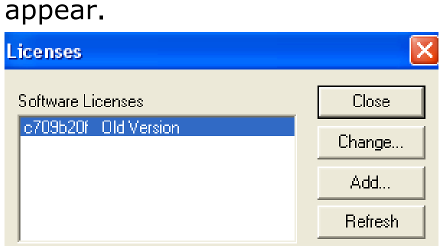
Troubleshooting Copy Protection Key

- 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. Refer to Figure 9-1, page 9–35.
   - A. Loosen the two screws that secure the male mounting block to the loading head assembly. Refer to Figure 9-1, page 9–35.
   - B. Loosen the screw that secures the connector assembly to the male mounting block.
   - C. Loosen the two setscrews in the male mounting block. Refer to Figure 9-2, page 9–36.
   - D. Loosen the two screws that secure the female mounting block to the load head interface block on the furnace assembly. Refer to Figure 9-3, page 9–37.
   - 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 loading head assembly and the load head interface block on the furnace assembly.
3. Grab the loading head at each side and 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, verify that 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 Cleaning the Loading Head Interface Block, page 9–39.

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 190-867 screws that secure the male mounting block to the load head assembly.
6. To check alignment, remove and install the FP628 loading head assembly.
7. If load head is easily removed and installed, then you have successfully aligned the FP628 load head assembly.
8. If the loading head is NOT easily removed and installed, then repeat steps 1 through 4.

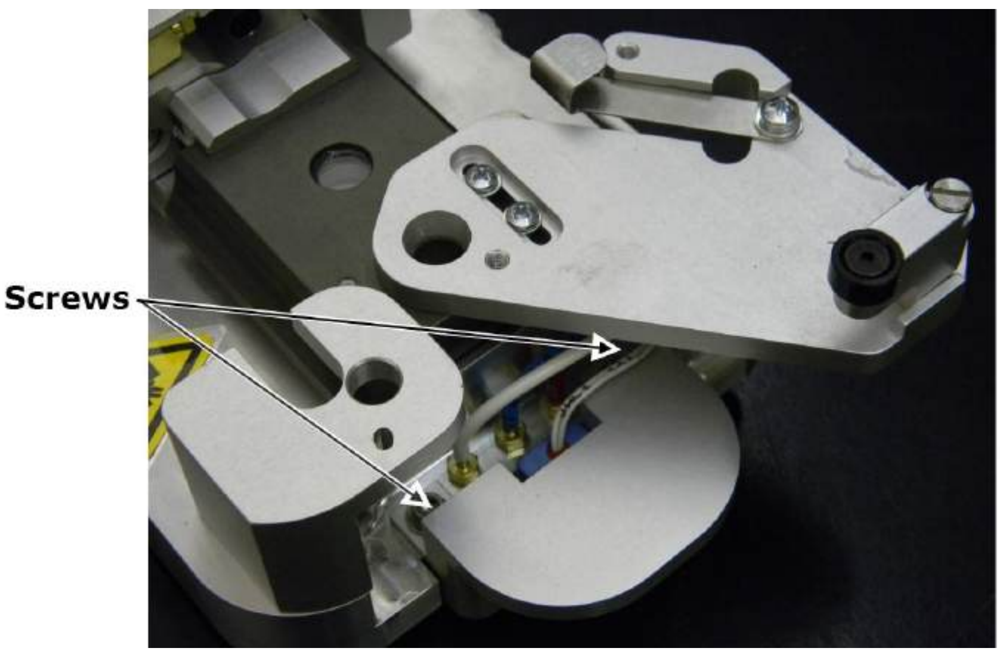
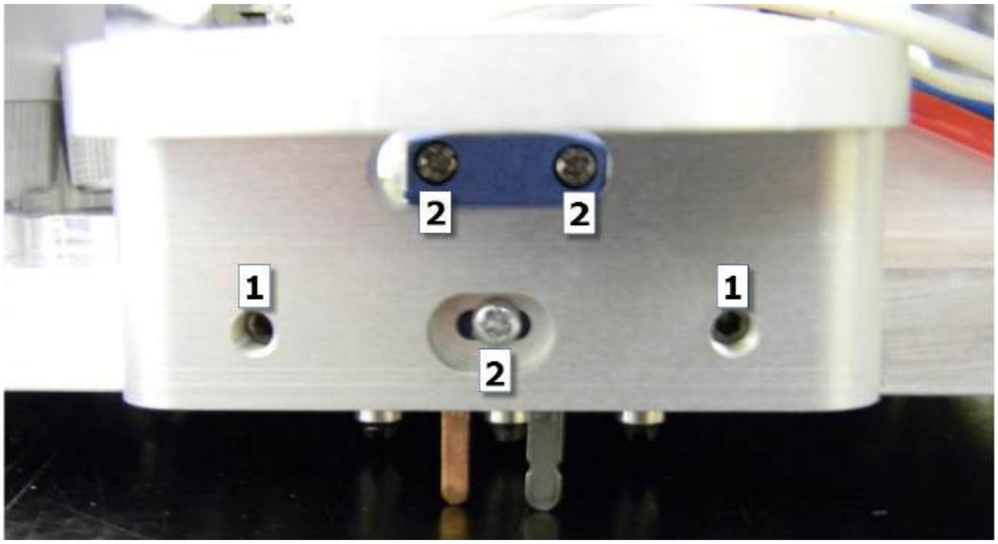
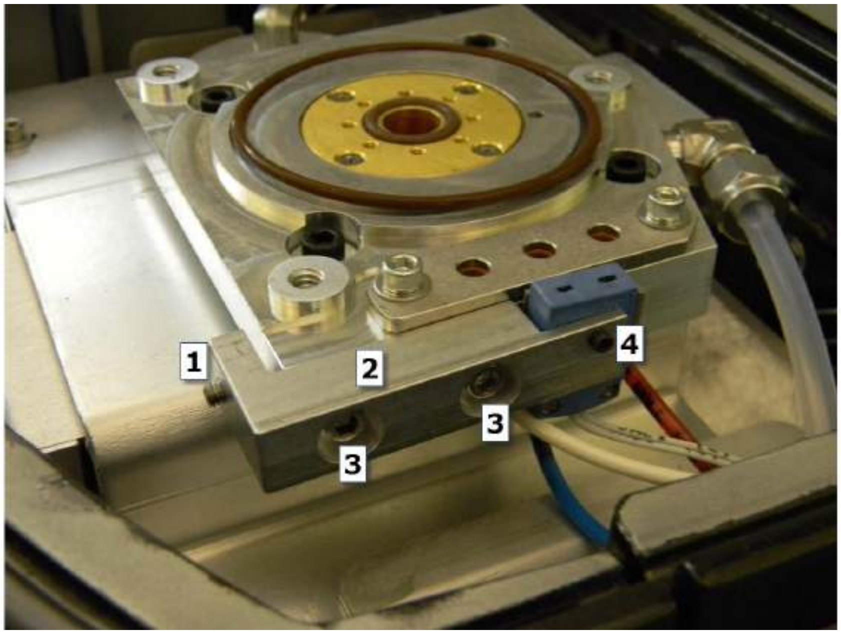


Figure 9-1
Male Mounting Block Top Screws



Number	Description
1	Setscrews
2	Screws

Figure 9-2
Male Mounting Block Screws



Number	Description
1	Setscrew
2	Female Mounting Block
3	Screws
4	Setscrew

Figure 9-3
Loading Heading Alignment—Interface Block

Initial Adjustment

1. Adjust the slide block speed by:
   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 the procedure outlined in Carousel Alignment, page 9–41.

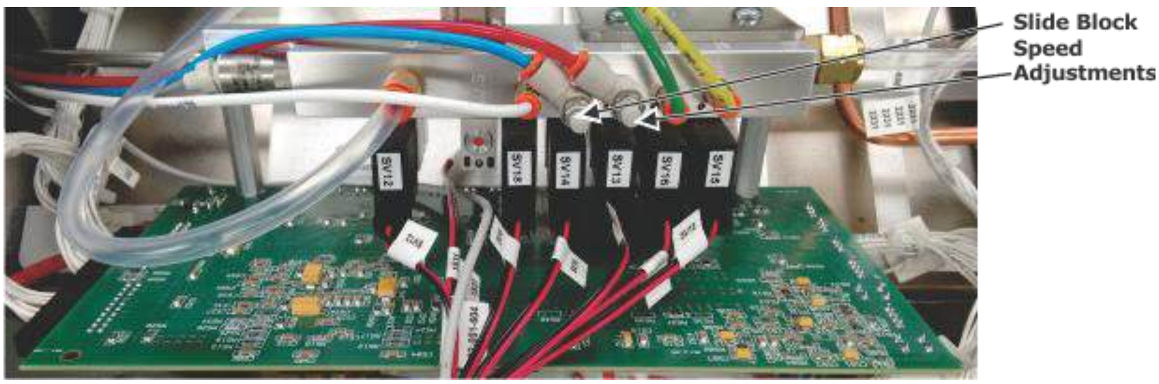


Figure 9-4
Slide Block Speed Adjustments

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 5–14.

Disassembly

1. Turn Off the pneumatic gas supply.
2. Remove the loading head. Refer to the procedure outlined in Loading Head Alignment and Adjustment, page 9–34.
3. Remove top furnace plate.
4. Refer to the procedure outlined in Replacing the Crucible, page 6–36, 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 190-867 8-32 Socket Head Screws, which secure the valve cap.
8. Carefully remove the valve cap. Make sure 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 ball bearings, springs, and holes.

Assembly

1. Insert two 617-212 Springs into two outside holes in load head interface block. Springs cannot be inserted into the 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 the 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 done after the loading head is adjusted. Refer to Loading Head Alignment and Adjustment, page 9–34.

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 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 9–42.
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 does not line up, move the actuator arm until it does. Refer to Figure 9-6, page 9–42.
10. Once it is aligned, take off the carousel 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 too slow in either direction, adjust the speed controls on solenoid valves SV13 and SV14. Refer to Figure 9-4, page 9–38.

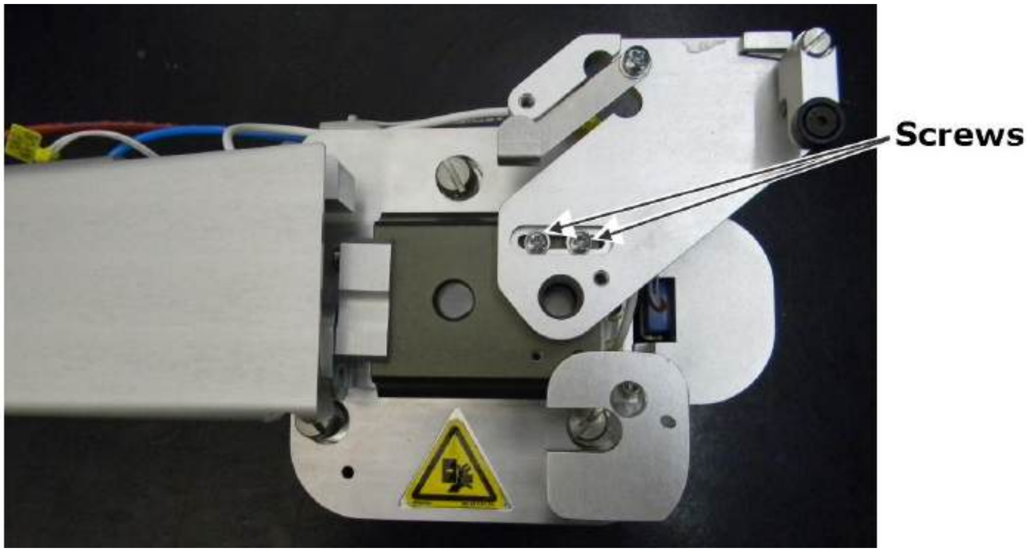


Figure 9-5
Carousel Actuator Arm Alignment

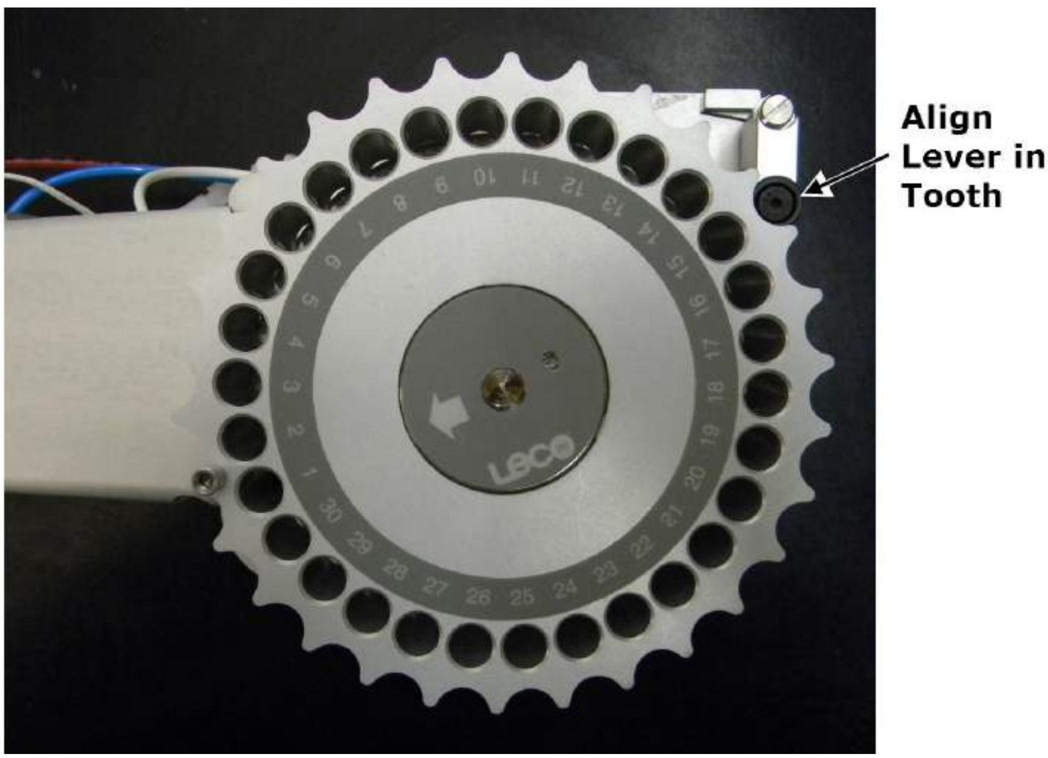


Figure 9-6
Carousel Alignment

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 5–14.

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. 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.

Troubleshooting

NOTE → For all heated zones, the control cards have protection built into their control loops to ensure the heated zones do not run away. Under certain circumstances, it is possible that this protection will be activated inadvertently via some unexpected transient condition. If this occurs, the error will show up in the error log. Restart the heated zone on the software Furnace page. If this does not work, reset the card in the Network page.

Troubleshooting Table

Use the troubleshooting table to locate and correct problems that may develop with the instrument.

Observed Problem	Possible Cause	Recommended Solution
All parameters in the software Ambient Chart are flat-lining.	Power to instrument may be Off.	Check that the power cord is plugged in.
	The power supply (PS1) may have failed.	Check that the LEDs on the cards are lit. Check that 24 VDC is present on J512AL and J512AK on the distribution card 666-512.
	Communications to the instrument may be lost.	Try to reset the network in the software diagnostics page. If this does not work, exit software, cycle power to the instrument, and restart the software. If this does not work, check the Ethernet connection between PC and instrument.
Some parameters in the software Ambient Chart are flat-lining.	There is a problem with the sensor that is flat-lining. If the flat-line is at the limit of the range of that sensor, the sensor may be disconnected.	Check electrical connections to sensors. Check that valves are working properly.
	A circuit card might not be working properly.	Using the cabinet schematic, check if all flat-lining parameters in the ambient chart are from the same circuit card. If so, check that the LEDs on the card are lit. Check electrical connections to the card. Also check the log file.

Observed Problem	Possible Cause	Recommended Solution
Readings and valve states are wrong.	Check the log file for errors.	Check for electrical shorts on circuit cards.
The furnace will not heat.	The diode (CR1) on the mechanical relay (K2) might have been installed backwards.	This will appear in the error log as an error with the FPGA on the furnace card. The band on the diode (CR1) should be on position 0 of the mechanical relay (K2).
	The connector J394H might not be connected correctly or a thermostat may have tripped, opening the interlock.	This will appear in the error log as an error with the FPGA on the furnace card. Check the connections on the 666-602X170 Furnace Card (A09).
	A thermocouple might have failed or become disconnected.	With the furnace Off, check the resistance of the furnace thermocouple (MT08), which should be about 1Ω.
	A furnace heating element may have failed.	With the furnace Off, measure the resistance of the heating elements in series, which should be about 80Ω to 120Ω at room temperature.
The detector oven will not heat.	The cell oven fan may have failed.	Check that the cell oven fan (FAN3) is working properly.
	One of the oven heaters may have failed or become disconnected.	Check the resistance of the oven heaters (HTR1 & HTR2) in parallel. They should be about 290Ω.
The reduction tube IR line heater (CHN628 only) and/or ballast oven will not heat.	A temperature sensor may be malfunctioning or has become disconnected.	Check the resistance of the temperature sensors. Reduction tube thermocouple (MT05) should be between 1 and 5Ω. The ballast (MT03) thermistor should be about 5000Ω at room temperature and decrease with increasing temperature.

Observed Problem	Possible Cause	Recommended Solution
	One of the two fans in the ballast oven may have failed.	Check that the ballast oven blower (FAN1), ballast fan (FAN2), and ballast fan-back side (FAN4) are working properly.
	A heater may have failed or become disconnected.	Check the resistance of the heaters. The reduction tube heater (HTR7) should be about 175Ω. The ballast heaters (HTR3 and HTR4) should be about 260Ω. Note that the ballast will not heat if the side panel is open. Check that SW15 is working properly.
The reduction tube is too hot.	The reduction tube thermocouple (MT05) may be malfunctioning or has become disconnected.	Check the location and resistance of the reduction tube thermocouple (MT05); it should be between 1 and 5Ω.
	The triac on the 666-514X140 Dual Heater Card (A7) may have failed short.	Check that the 666-514X140 Dual Heater Card (A7) is working properly.
The ballast oven is too hot.	A temperature sensor may be malfunctioning or have become disconnected.	Check the location and resistance of the ballast (MT03) thermistor; it should be about 5000Ω at room temperature and decrease with increasing temperature.
	The ambient room temperature may be too high.	Check that the room temperature is 35°C (95°F) or less. Check that there is sufficient airflow around the instrument.
	The triac on the 666-514X140 Dual Heater Card (A7) may have failed short.	Check that the 666-514X140 Dual Heater Card (A7) is working properly.

Observed Problem	Possible Cause	Recommended Solution
The thermal electric cooler temperature is not holding at 5°C (CN628 and FP628 only).	The Peltier Cooler (HP1) might have failed or become disconnected.	Check the resistance of the Peltier Cooler (HP1); it should be about 10Ω at room temperature.
	The TEC Thermistor might have failed or become disconnected.	Check the resistance of the TEC Thermistor (MT9); it should be 12,700Ω at 5°C and 5,000Ω at 25°C.
	The TEC Exhaust fan may have failed or become disconnected.	Check that the TEC Exhaust Fan (FAN2) is spinning.
Samples do not drop out of carousel into loading head.	Samples wrapped with too large of a diameter.	Wrap samples so that they fit smoothly into carousel.
	Carousel not properly aligned.	Refer to Loading Head Alignment and Adjustment, page 9–34.
	Sample drop jaw may be stuck due to dirt.	Refer to Cleaning the Loading Head, page 6–38.
	Electrical connection on bottom right side of loading head may be damaged or not lined up.	Verify the condition of the 2-prong electrical connector on the loading head. Verify that the connector is properly aligned to the matching connector on the interface block. Refer to Loading Head Alignment and Adjustment, page 9–34.
	Solenoid plunger or compression spring may be damaged or corroded.	Check the 619-976 Plunger and the 617-221 Spring for wear and replace if necessary. Refer to Figure 10-39, page 10–47.

Observed Problem	Possible Cause	Recommended Solution
The TC Cell temperature is not 57.3±0.5°C.	The TC cell heater leads may have broken away from the terminal blocks on the 666-721X120 TC Cell Block Heater Card (A10).	Strip the leads of the heater (HTR6) and reconnect them to TB2 and TB3 of the 666-721X130 Card (A10).
	There may be no power to the 666-721X120 TC Cell Block Heater Card (A10).	Check that the power from the 666-721X130 TC cell card (A10) is connected from J291F to J634.
	There may be no signal from the 666-721X120 TC Cell Block Heater Card (A10).	Check that the signal to the 666-721X130 TC Cell Card (A10) is connected from J634A to J291H.
The results are consistently noisy.	A fan in the detector oven or ballast could have failed or become disconnected.	Check that all fans are working properly.
	One of the back or side panels might not be in place.	Check that the side and back panels are in place so that ambient air cannot enter the ballast oven.
	The TC cell might not be properly insulated.	Check that the cover of the TC cell is properly in place. Check for potential air leaks into the TC cell.
Persistent noise spikes on TC Cell reading.	Cell may be dirty.	Remove cell for cleaning. Refer to Removing and Servicing the TC Cell, page 9–43.
	O-rings at IR cell connection may be dry.	Check o-rings at IR cell connections.
High Blanks	Atmosphere may be leaking into system.	Check system for leaks. Refer to Leak Check, page 8–19.
	Reduction catalyst may be spent.	Repack reduction heater tube. Refer to Packing the Reduction Heater Tube, page 6–23.

Observed Problem	Possible Cause	Recommended Solution
A pinch valve is not toggling.	Pneumatic gas is not being supplied to the pinch valve.	Verify that pneumatic pressure is present in the flexible line connected to the pinch valve.
	Electrical signal is not being applied to the pinch valve solenoid.	Verify that the electrical connector is connected to the pinch valve and is providing 24VDC when the pinch valve is toggled.
	O-rings in the pinch valve body are stuck or leaking.	Disassemble and inspect pinch valve body and o-rings. Clean, grease, or replace o-rings if necessary.
	Pinch valve solenoid has failed.	Replace solenoid if necessary.
Ballast fill timeout	Ballast is filling too slowly because of a leak in the system.	Check system for leaks. Refer to Leak Check, page 8–19.
	Ballast fill timeout is not set properly for methods with slow burns.	Verify method parameters.
Ballast piston to home timeout	Ballast piston is not able to return to home position because ballast exhaust line is restricted.	Check that C-Flex tubing running from PV3 to back of unit is not crimped or restricted. Check that PV3 is opening properly.
	Ballast piston home sensor is not reading correctly.	Check that piston home switch (SW13) is connected and is functioning properly.

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10 Illustrations

The Illustration chapter can assist in procedures, verify information during setup, and help to locate parts within the instrument and part numbers.

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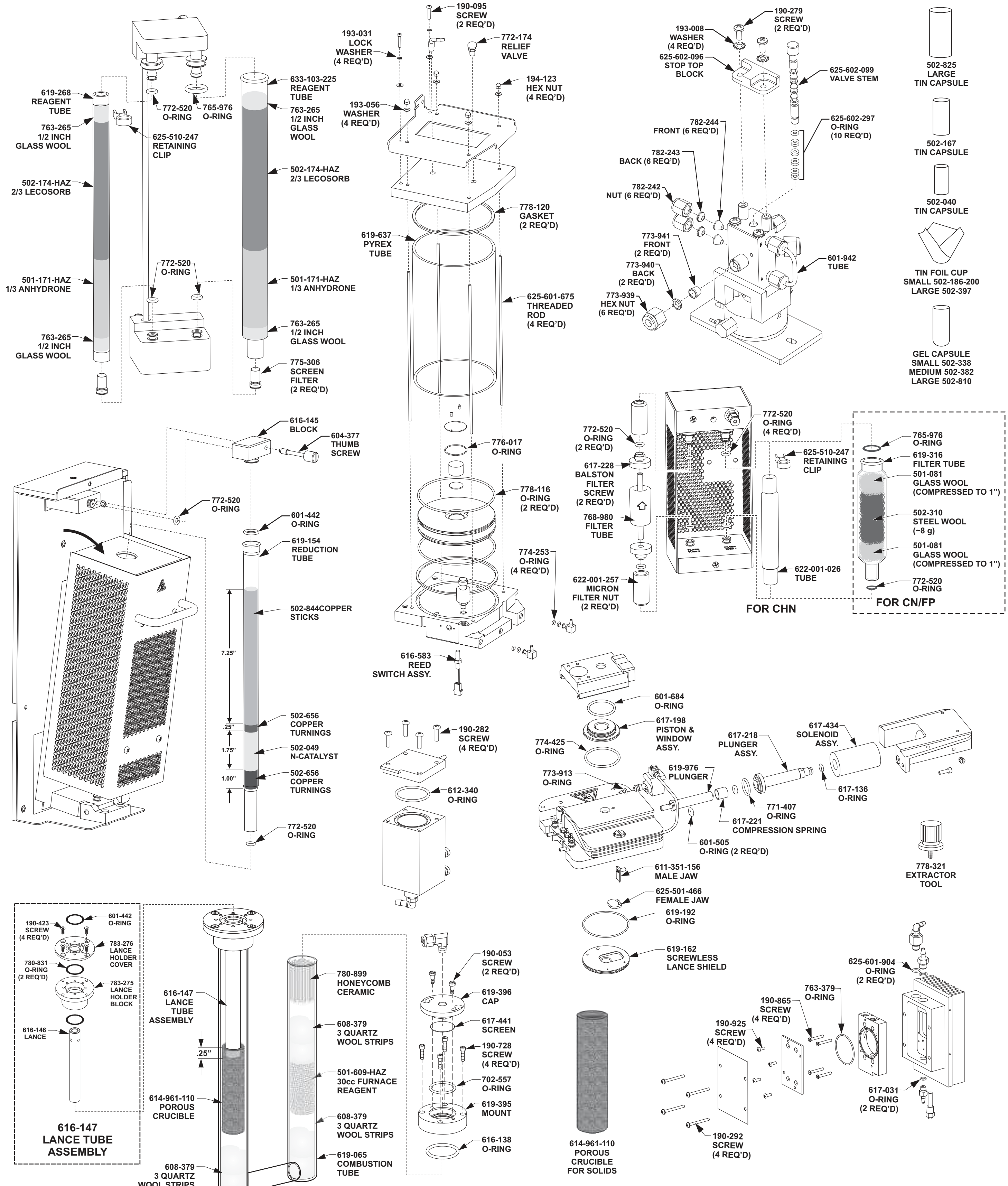
CHN628 Series
Consumables & Spare Parts Reference Card

LECO®
Delivering the Right Results

Note: Part numbers and standards' values may change. Consult LECO for the latest information.



See reverse side for contact information

GENERAL COMBUSTION SUPPLIES

501-171-HAZ Anhydrone 454 g (1 lb.) bottle
502-189 Copper Sticks 100 g ampule
502-844 Copper Sticks 100 g bottle
502-656 Copper Turnings 60 g bottle
501-081 Glass Wool 454 g (1 lb.) box
763-265 Glass Wool 227 g (0.5 lb.) package
502-174-HAZ Lecosorb 500 g bottle
502-049 N-Catalyst 50 g bottle
608-379 Quartz Wool Strips 10/pk
502-310 Steel Wool 454 g (1 lb.)
501-609-HAZ Furnace Reagent
625-602-470 Ballast C-Flex Replacement Assembly

CAPSULES AND CRUCIBLES

502-338 Gel Capsule, Small 400/pkg
502-382 Gel Capsule, Medium 400/pkg
502-810 Gel Capsule, Large 400/pkg
614-961-110 Porous Crucibles for solids 10/pk
617-605 Porous Crucibles for liquids 10/pk
502-040 Tin Capsules, Small 100/bottle
502-040-100 Tin Capsules, Small 1000/bottle
502-167 Tin Capsules, Medium 100/bottle
502-825 Tin Capsules, Large 50/bottle
502-186-200 Tin Foil Cups, Small 100/bottle
502-186-100 Tin Foil Cups, Small 1000/bottle
502-397 Tin Foil Cups, Large 100/bottle
502-397-400 Tin Foil Cups, Large 400/bottle

OPERATION ACCESSORIES

502-007 Tube Cleaner
601-981 Wire Brush
616-152 Crucible Extractor Tool
775-306 Secondary Filter, 10 micron
775-307 Filter Tool, Thumbscrew
502-023 Funnel Quick Disc
778-321 Lance Extraction Tool
502-213 Leak Detection Solution
762-515 O-ring Tool - Removal
616-513 O-ring Tool - Installation
768-980 Particle Filter
604-398 Sample Cup Holder, Large
604-373 Sample Cup Holder, Small
778-405 10-Sample Storage Block
501-614 Spatula
619-180-110 Stackable Carousel Assembly
502-028 Tweezers
604-378 Tweezers, Curved (SST)
501-241 Vacuum Grease
619-380 Vacuum Cleaner Attachment Assembly
619-377 Bypass Plate

COMBUSTION TUBES AND GLASSWARE

601-390 Glass Filter Tube (wide mouth top, small bottom) requires one (1) 765-976 Top O-ring and one (1) 772-520 Bottom O-ring for sealing
622-001-026 Glass Filter Tube (small mouth top and bottom) requires 772-520 O-rings for sealing
619-268 Reagent Tube, requires 772-520 O-rings for sealing
619-154 Reduction Tube, requires 601-442 O-rings for sealing
780-899 Honeycomb Ceramic Stop
619-065 Combustion Tube
617-441 Screen Filter
633-103-225 Reagent Tube, requires 765-976 Top O-ring and 772-520 Bottom O-ring for sealing

NATURAL MATRIX SET-UP STANDARDS

Part No.	Description	% C	% H	% N	% S	Contents
501-561-150	Soy Flour	—	—	8.0–10.0	—	50 g
501-563-150	Corn Flour	—	—	0.8–1.6	—	50 g
502-055	Orchard Leaves	44.0–52.0	5.7–6.5	2.0–2.8	0.15–0.25	20 g
502-082	Tobacco Leaves	35.0–47.0	4.0–7.0	2.0–4.0	0.3–0.8	20 g
502-272	Corn Gluten	51.0–53.0	7.0–7.5	11.0–12.0	0.75–1.0	50 g
502-273	Alfalfa	45.0–47.0	5.5–6.5	2.5–5.0	0.25–0.35	50 g
502-274	Wheat Flour	44.0–46.0	6.0–7.0	2.5–3.5	0.15–0.25	50 g
502-275	Rye Flour	43.5–45.5	6.0–7.0	1.5–2.5	0.10–0.20	50 g
502-276	Oat Meal	45.0–47.0	6.0–7.0	2.5–3.5	0.15–0.25	50 g
502-277	Barley	45.0–47.0	6.0–7.0	1.0–3.0	0.10–0.20	50 g
502-278	Rice Flour	43.0–45.0	6.0–7.0	1.0–3.0	0.10–0.20	50 g

PURE CHEMICAL SET-UP STANDARDS

Part No.	Description	% C	% H	% N	% O	Contents
501-050	Nicotinic Acid	58.53	4.09	11.38	—	15 g
502-092	EDTA	40.80–41.20	5.46–5.54	9.52–9.60	—	50 g
502-211	Glycine	32.00	6.71	18.66	42.63	50 g
502-642	Phenylalanine	65.4	6.7	8.5	—	50g

COAL AND COKE REFERENCE MATERIALS

Part No.	Description	% Sulfur	% C	% H	% N	Contents
502-680	Coal Prox Plus Low	~0.3	~81.0	~4.0	~1.0	50 g
502-681	Coal Prox Plus Med.	~1.3	~78.0	~5.0	~1.5	50 g
502-682	Coal Prox Plus High	~0.5	~75.0	~5.0	~1.5	50 g
502-683	Met Coke Prox Plus	~0.75	~87.0	~0.3	~1.0	50 g
502-684	Pet Coke Prox Plus	~5.5	~87.0	~3.6	~1.5	50 g

CERTIFIED REFERENCE MATERIALS

Part No.	Description	% S	% C	% H	% N	Contents
501-439	Mineral Oil CRM	—	~86.0	~13.80	—	118 ml (4 oz.)
502-816	Residual Fuel Oil	~3.0	~86.0	~10.0	~0.3	118 ml (4 oz.)
502-831	QAR CRM Coal 1	1.5	74.6*	4.8	1.7	50 g
502-832	QAR CRM Coal 2	0.25	70.0*	4.0	0.9	50 g
502-833	QAR CRM Coal 3	0.34	81.0*	4.01	1.1	50 g
502-834	QAR CRM Coal 4	0.30	68.5*	4.3	0.9	50 g
502-835	QAR CRM Coal 5	0.5	68.5*	5.0	1.7	50 g
502-836	QAR CRM Coal 6	3.99	70.2*	4.9	1.3	50 g
502-837	QAR CRM Coal 7	3.26	72.6*	4.9	1.4	50 g
502-838	QAR CRM Coal 8	0.7	68.5*	4.9	1.2	50 g
502-839	QAR CRM Coal 9	2.1	77.5*	5.1	1.5	50 g

**For information purposes only.*

**Values vary—contact LECO for current levels.*
NOTE: Part numbers and standards' values may change. Consult LECO for latest information.

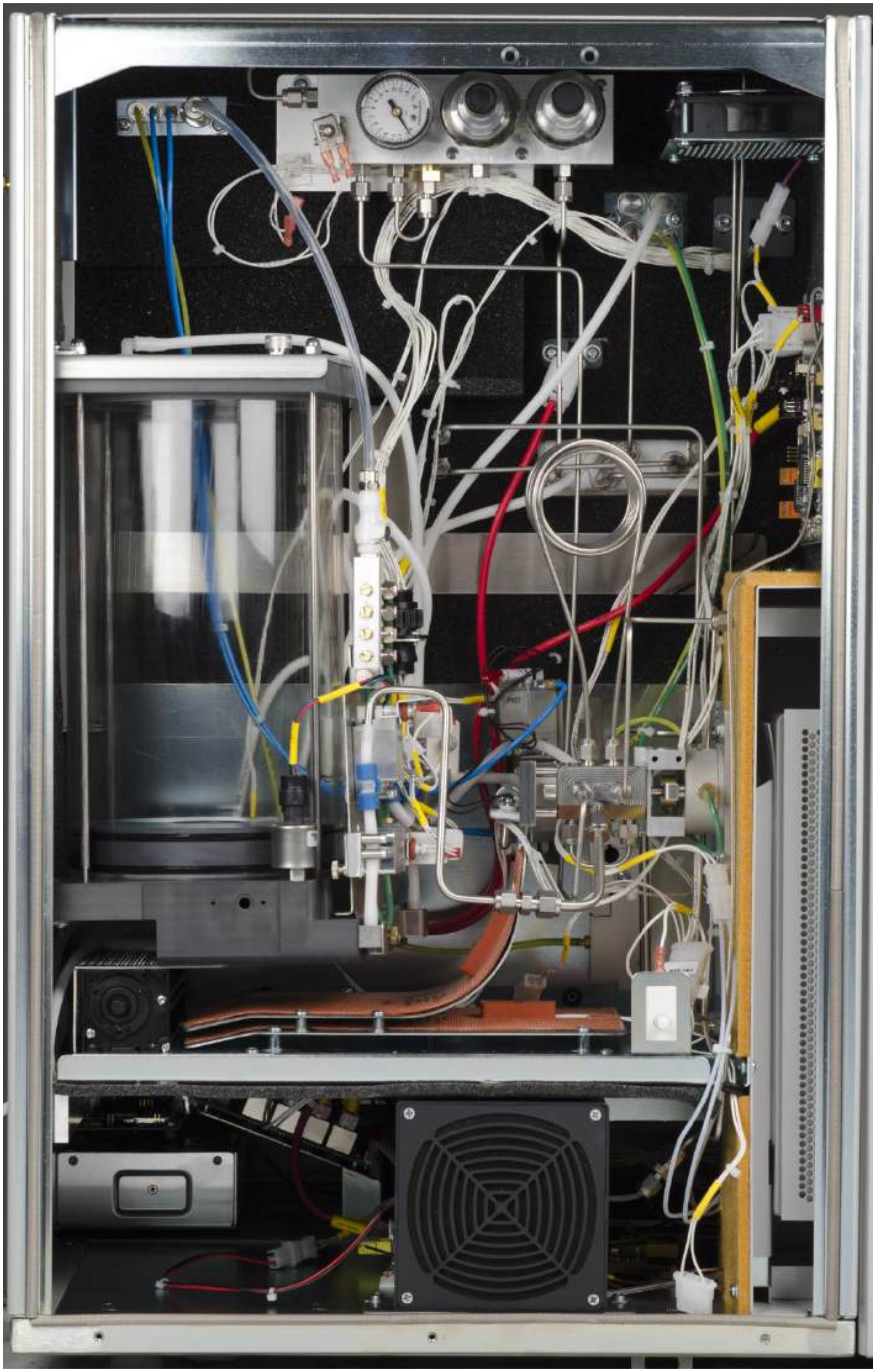


Figure 10-3
Left Side View

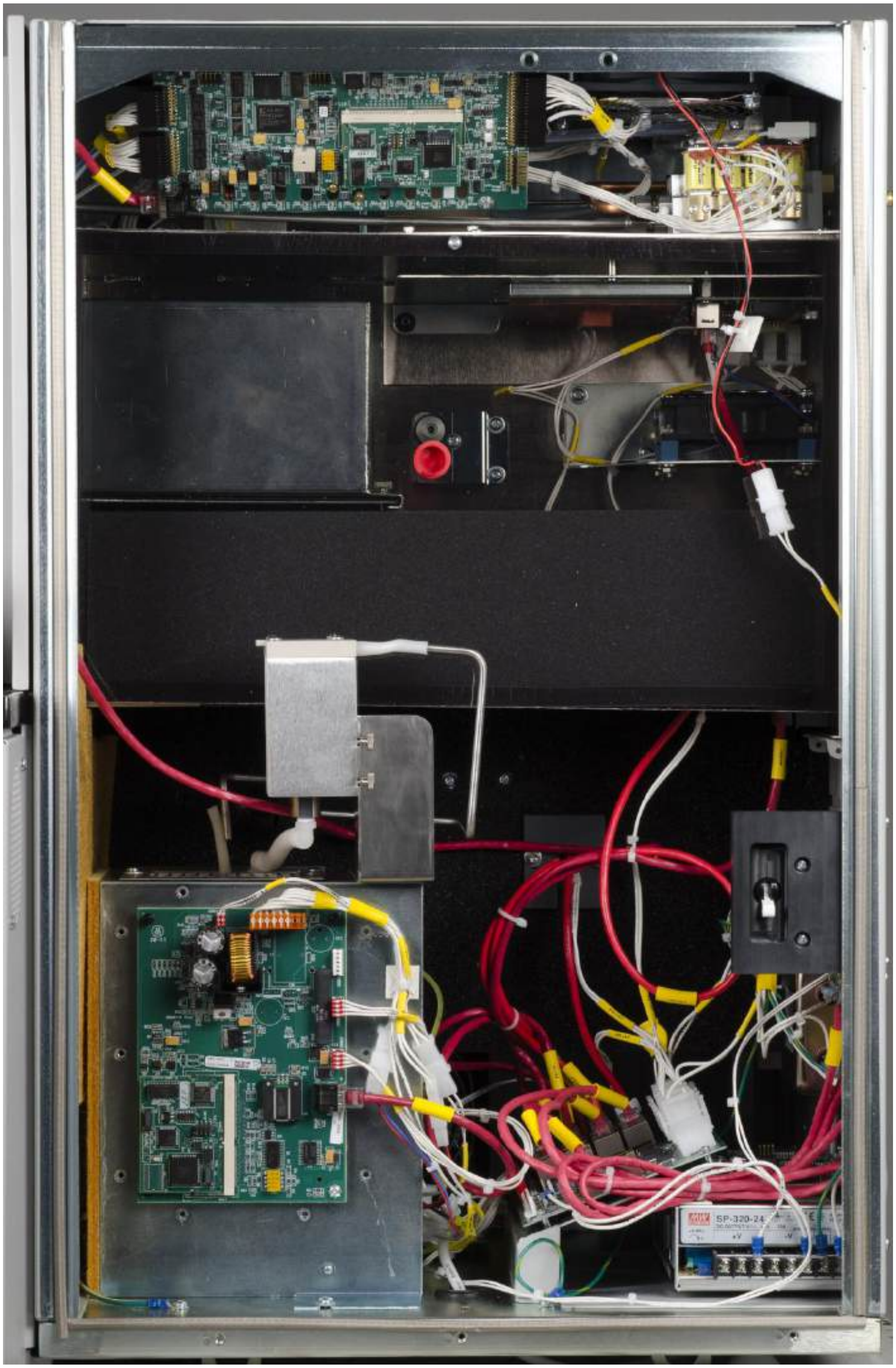


Figure 10-4
Right Side View

WIRE NO.	PART NUMBER	COLOR	GA	LENGTH	WIRE MARKER	END PREPARATION			END PREPARATION			ADDITIONAL SPECIFICATIONS	
						STRIP	TIN	HARDWARE	STRIP	TIN	HARDWARE	FROM:	TO:
1	322-999-999	WHT	22	9								J634A-1	J291H-2
2	322-999-999	WHT	22	9								J634A-3	J291H-1
3	322-999-999	WHT	22	7								J634-1	J291F-1
4	322-999-999	WHT	22	7								J634-4	J291F-2

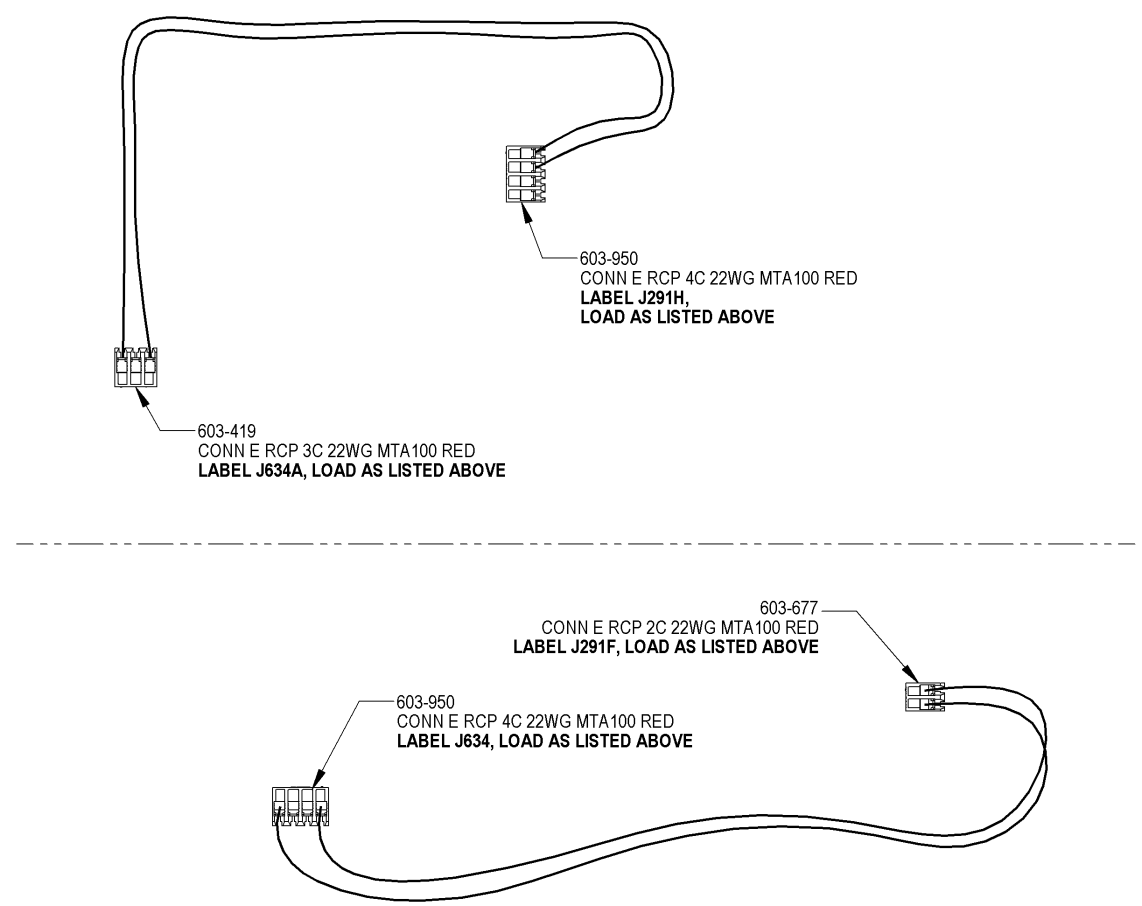


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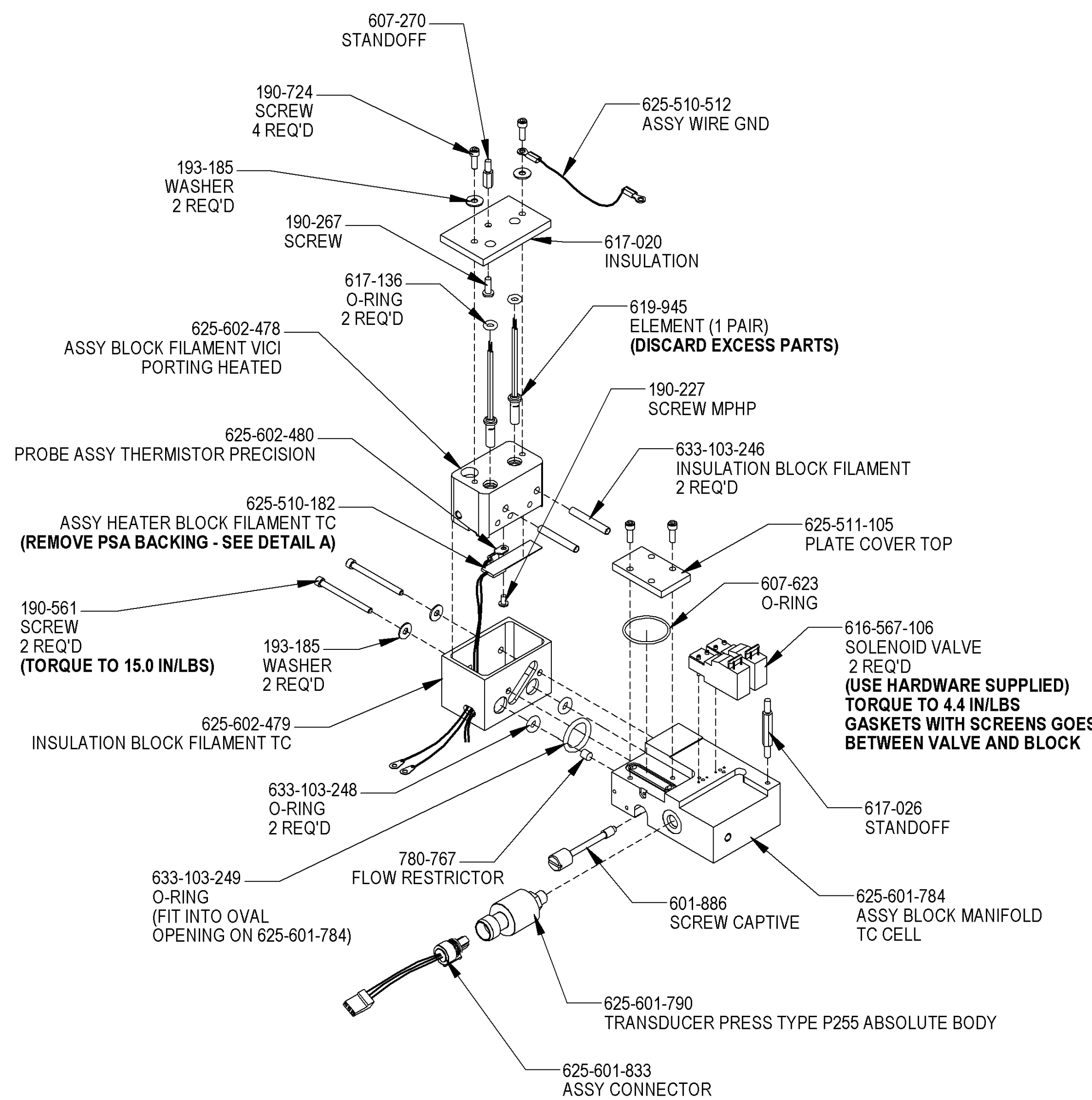
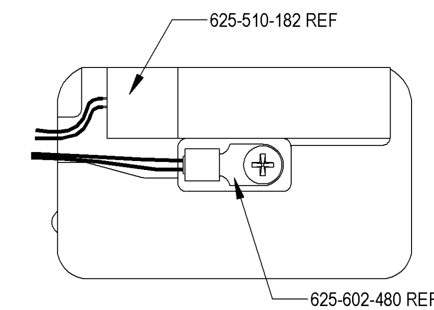
Figure 10-5
TC Cell Assembly Connector





PEEL ADHESIVE PROTECTION LAYER FROM 625-510-182 HEAT PAD AND SECURE AS SHOWN TO THE 625-601-787 ASSY BLOCK FILAMENT. NOTE: MAKE CERTAIN WIRES ARE ARRANGED THRU CHANNEL AS SHOWN.

DETAIL A

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Figure 10-6
TC Cell Manifold Assembly

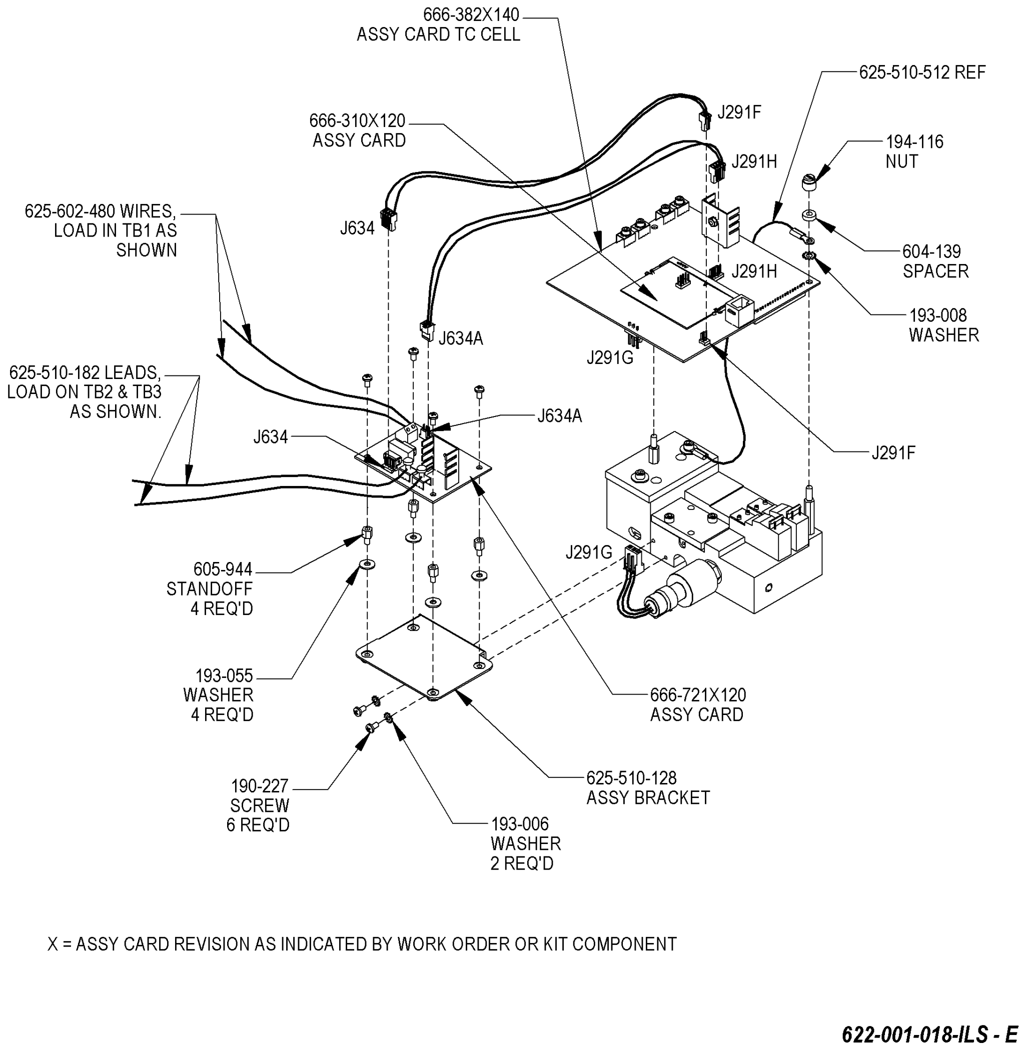
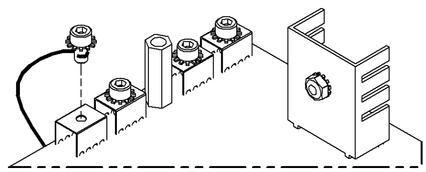


Figure 10-7
TC Cell Assembly Card

NOTES:

1. PREP LEADS BY WRAPPING THEM TIGHTLY AROUND THREADED PORTION OF SCREWS AS SHOWN, (ALL 4 LEADS).

2. DO NOT WRAP LEAD MORE THAN 1/2 WAY AROUND SCREW.



LEAD PREP DETAIL

3. SECURE LEADS UNDER WASHER AND SCREW AS SHOWN. TORQUE SCREWS TO 8.5 IN/LBS.

4. INSTALL CONNECTORS INTO THEIR APPROPRIATE LOCATIONS.

5. SECURE LEADS TO TERMINAL BLOCKS.

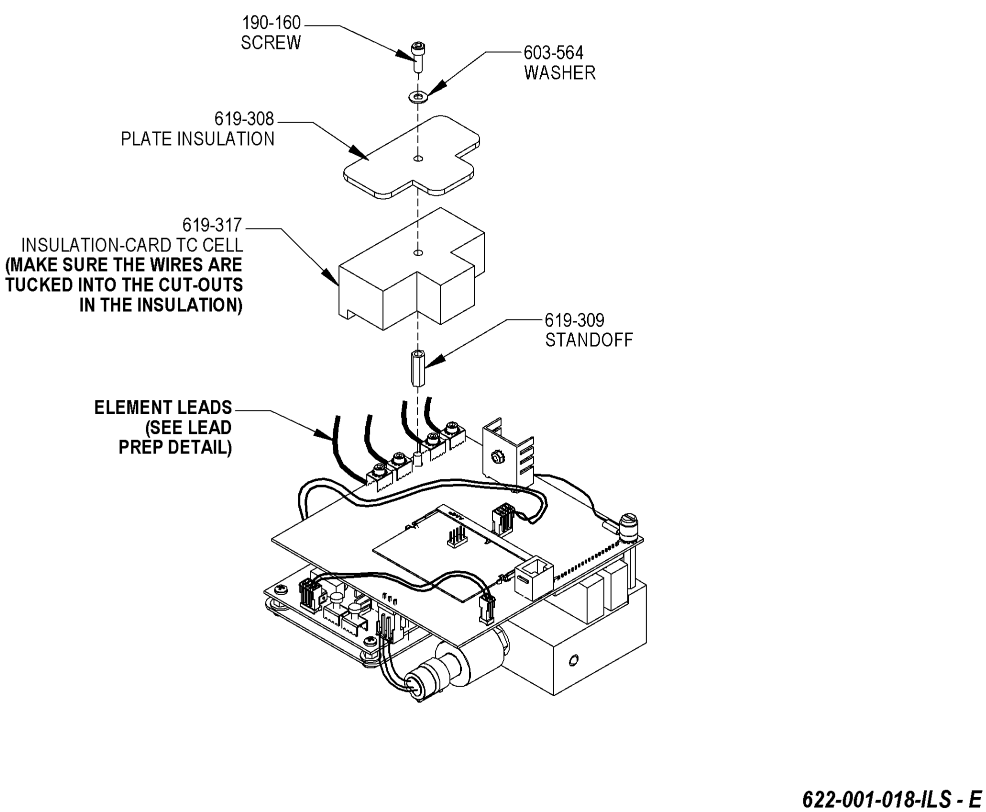


Figure 10-8
TC Cell Leads

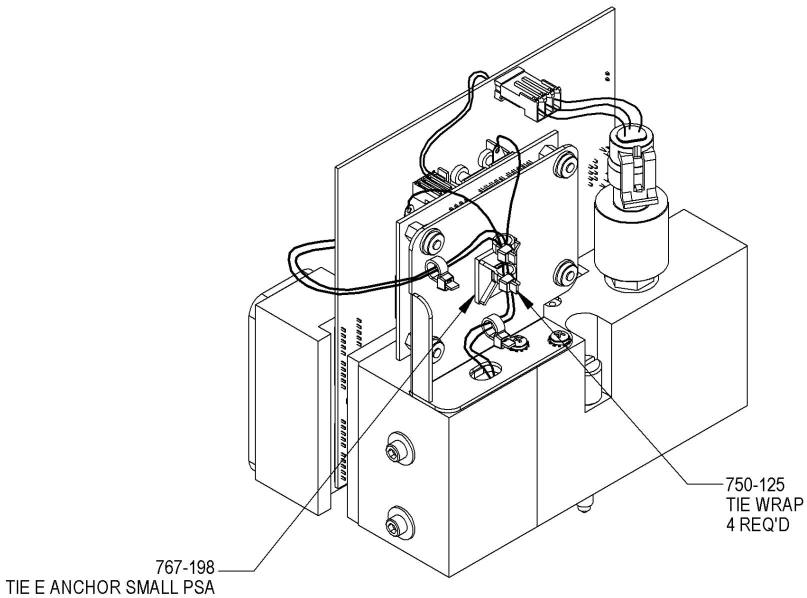


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Figure 10-9
TC Cell Assembly

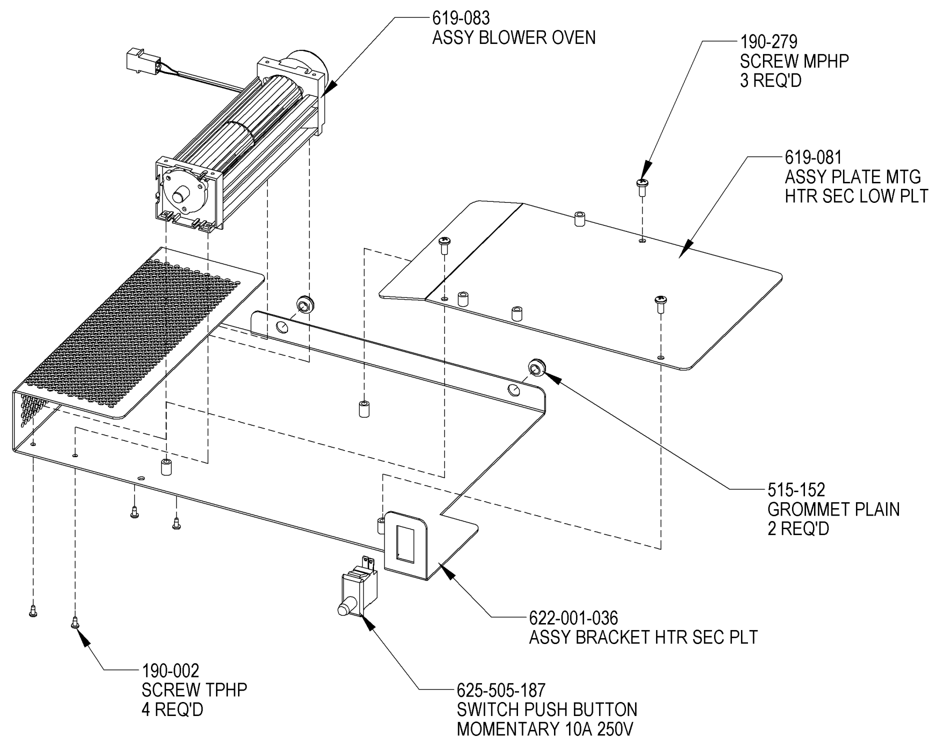


Figure 10-10
Oven Blower Assembly

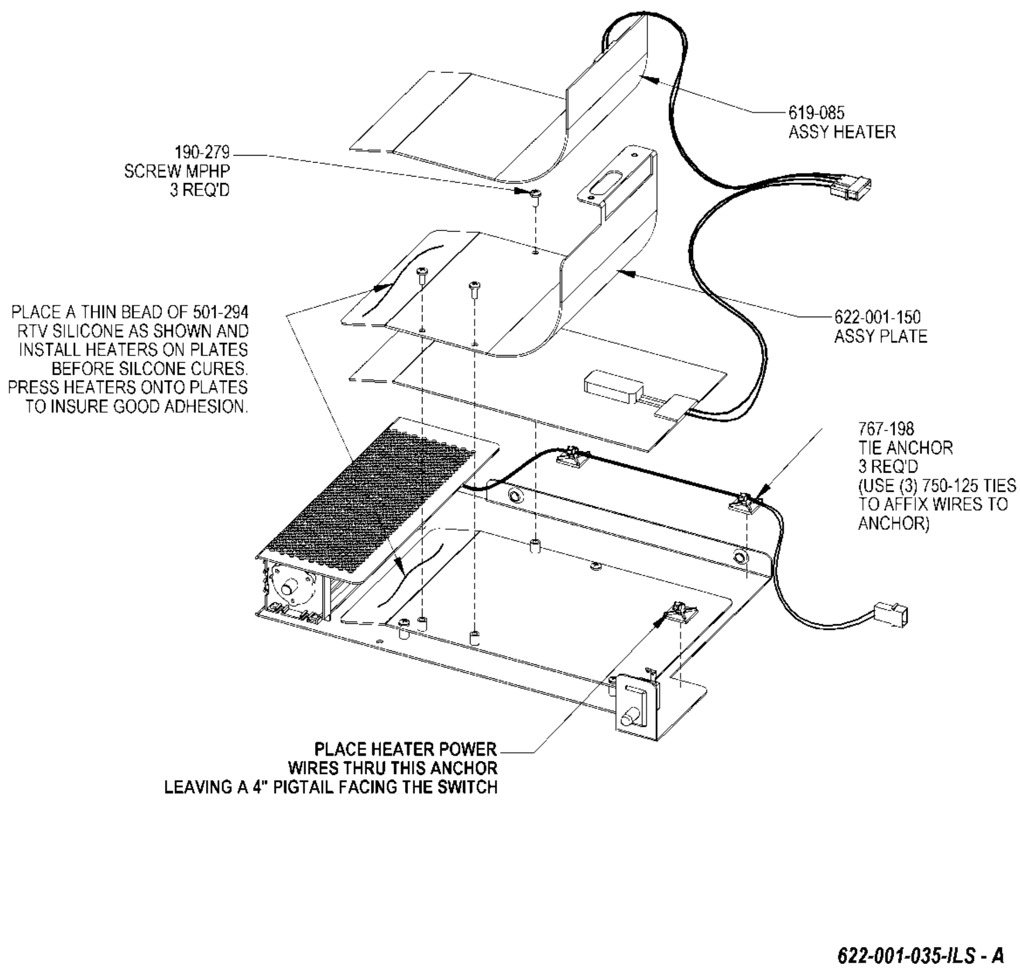


Figure 10-11
Heater Plates Assembly

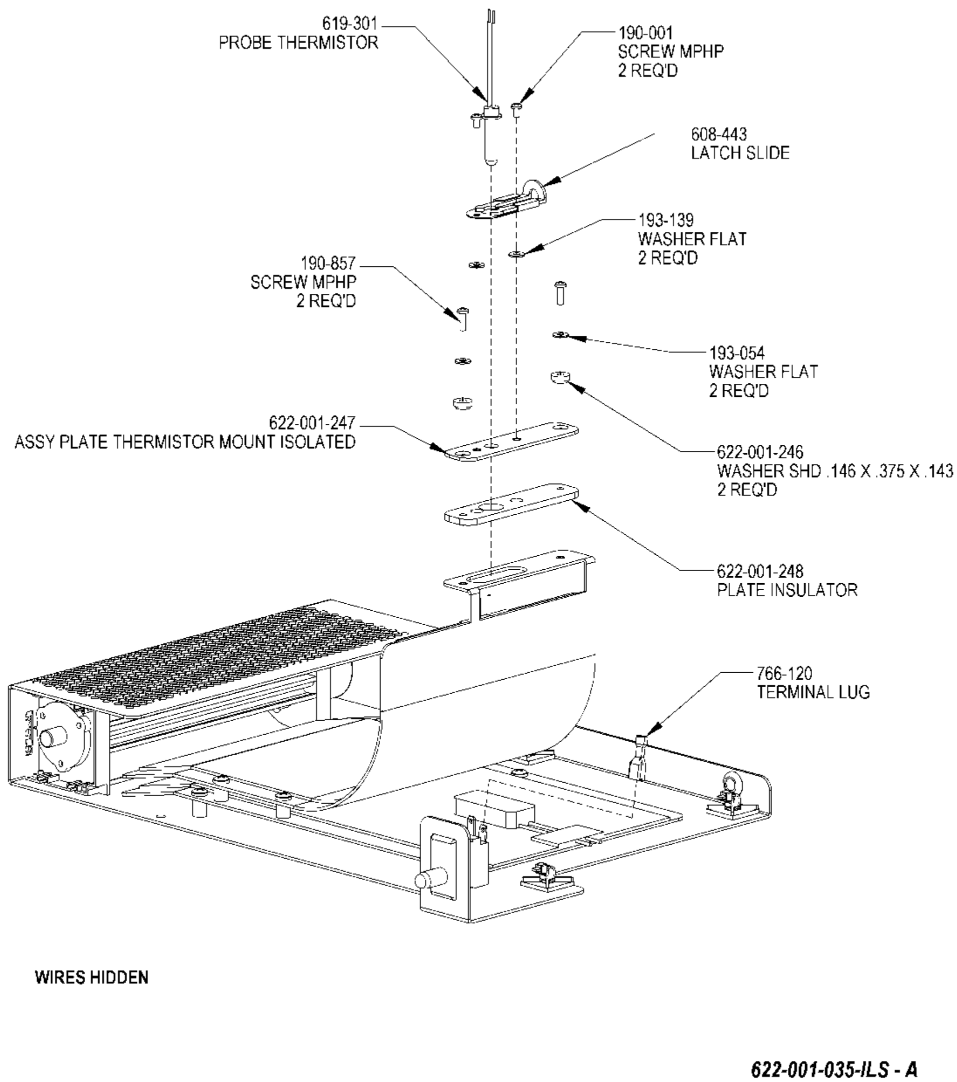


Figure 10-12
Attaching Heater Plate Assembly

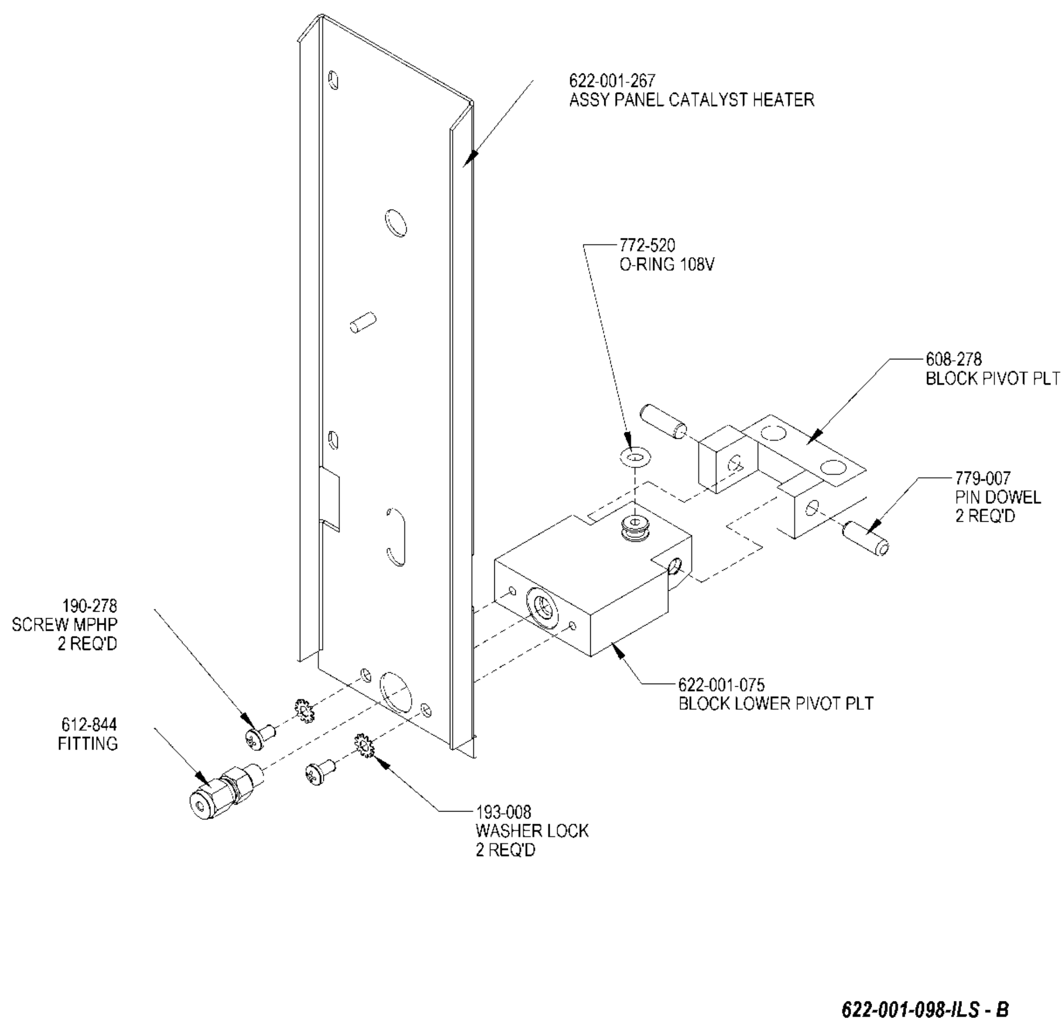
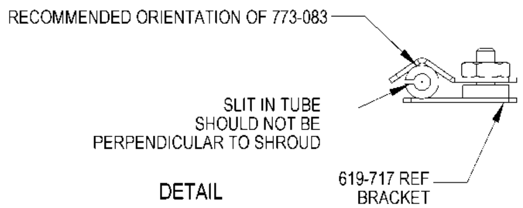


Figure 10-13
Catalyst Heater Lower Block Assembly



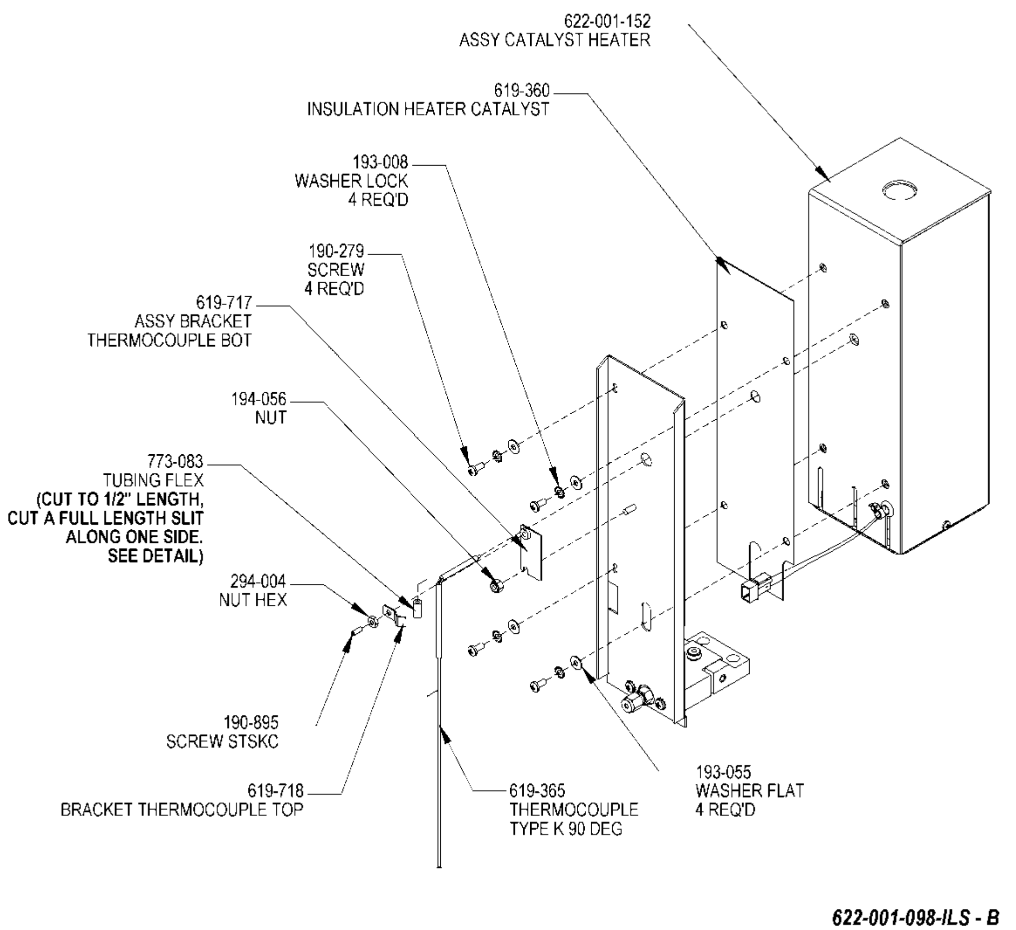


Figure 10-14
Catalyst Heater Back Panel Assembly

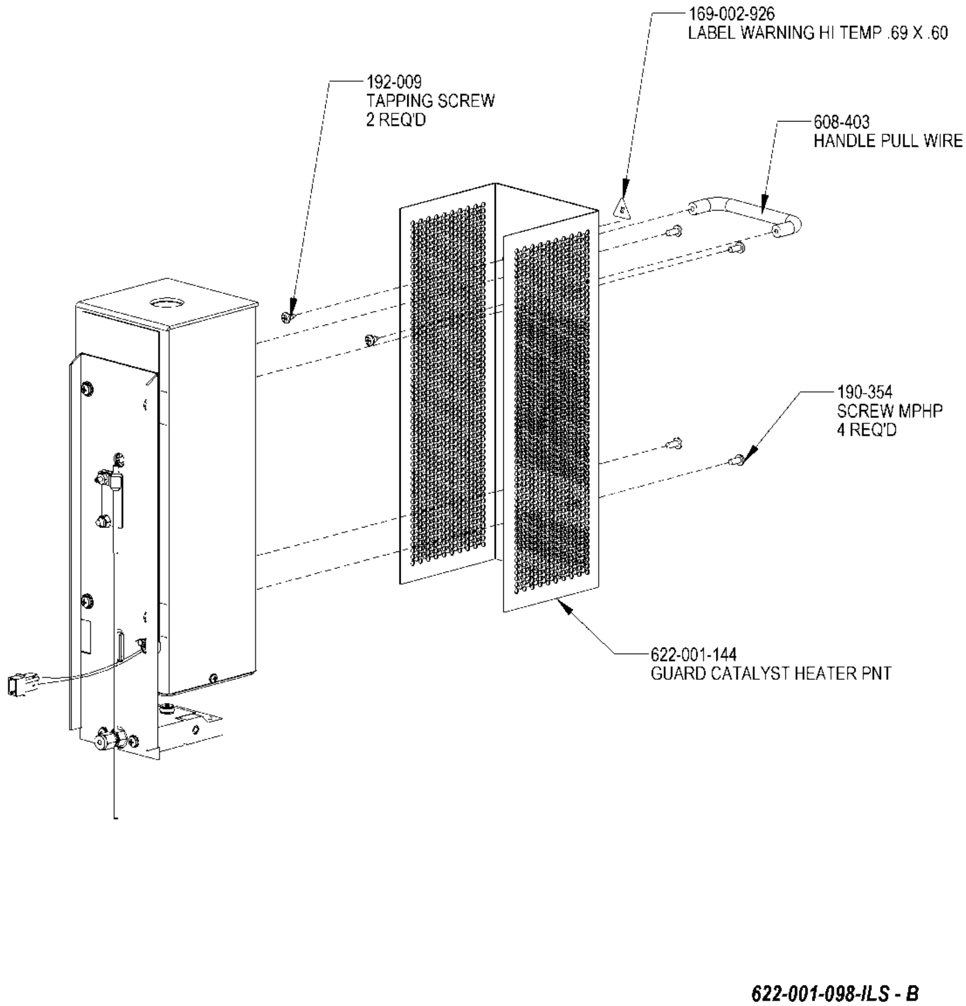


Figure 10-15
Catalyst Heater Front Panel Assembly

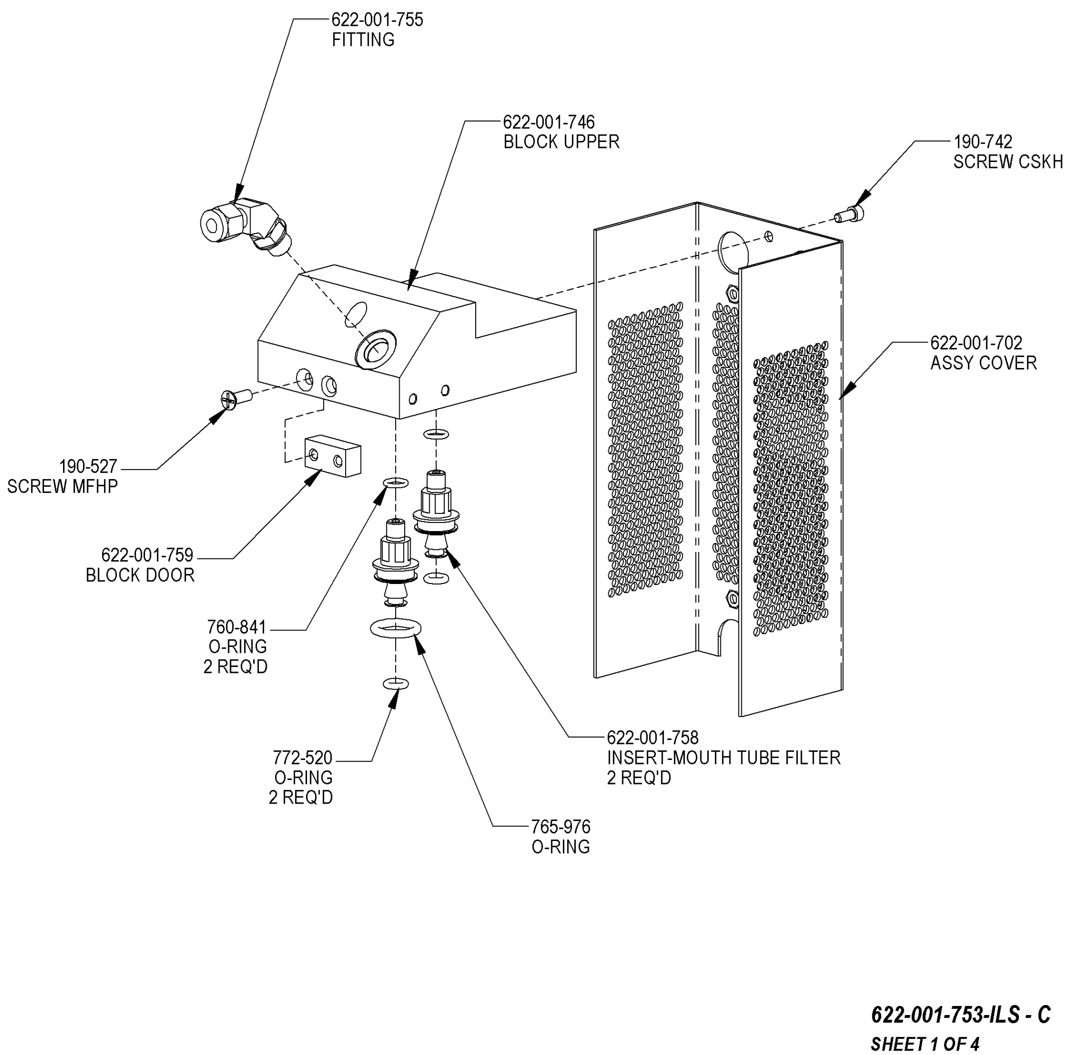


Figure 10-16
Manifold Tube Filter Upper .25 Furnace Exh Assy 1 of 4

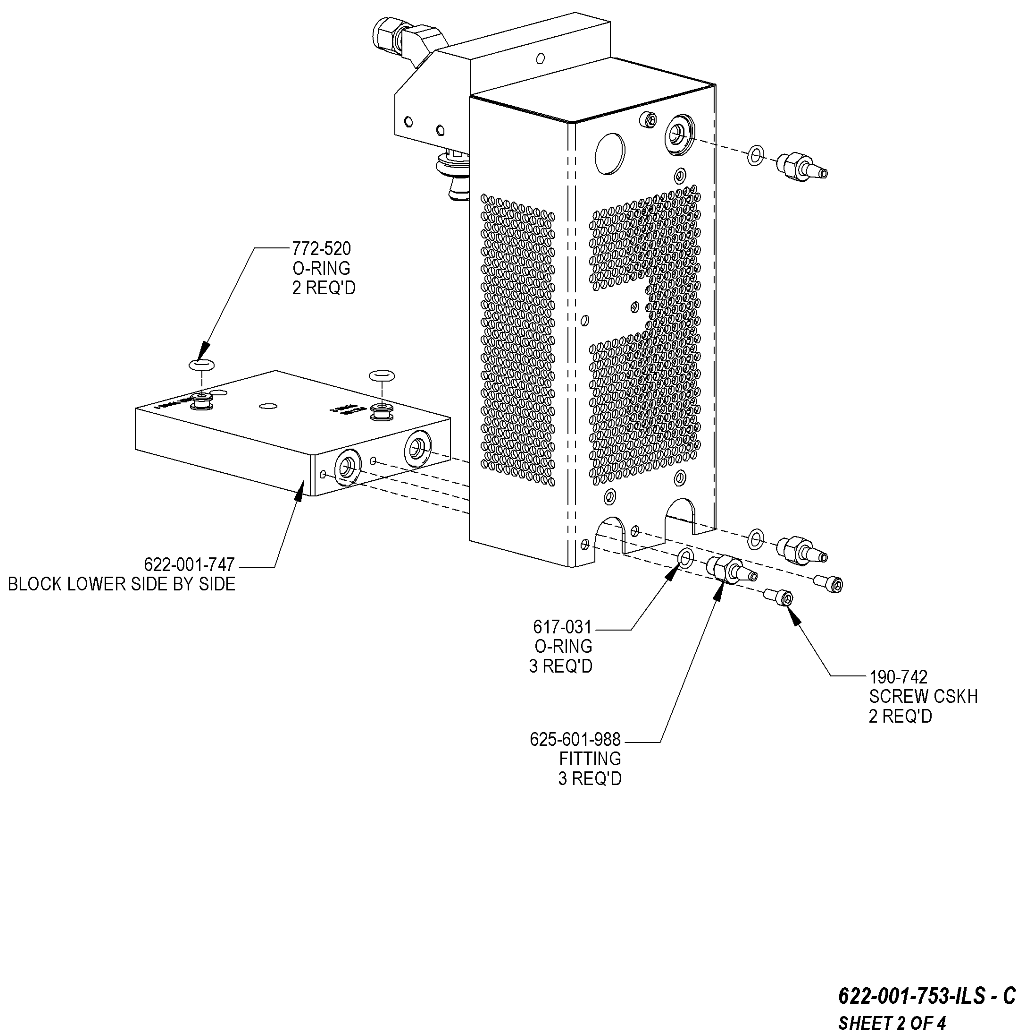


Figure 10-17
Manifold Tube Filter Upper .25 Furnace Exh Assy 2 of 4

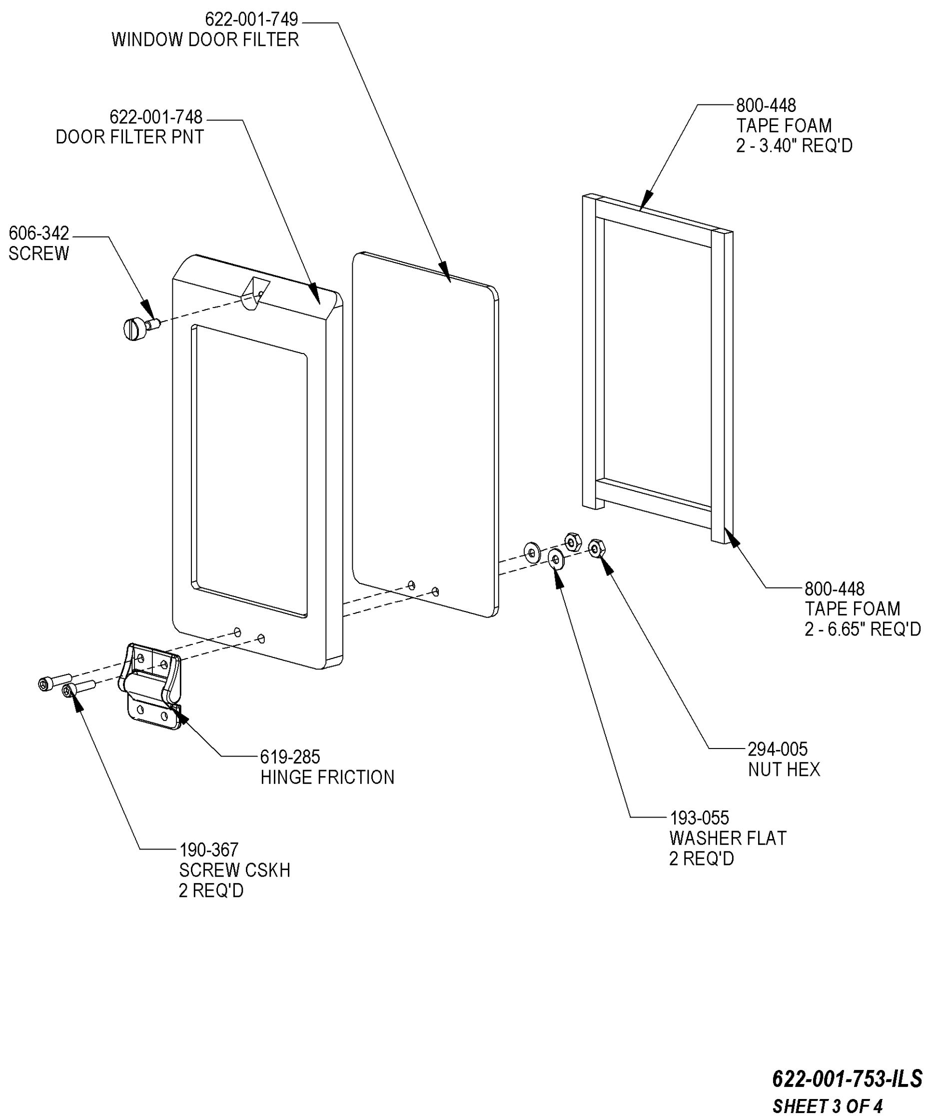


Figure 10-18
Manifold Tube Filter Upper .25 Furnace Exh Assy 3 of 4

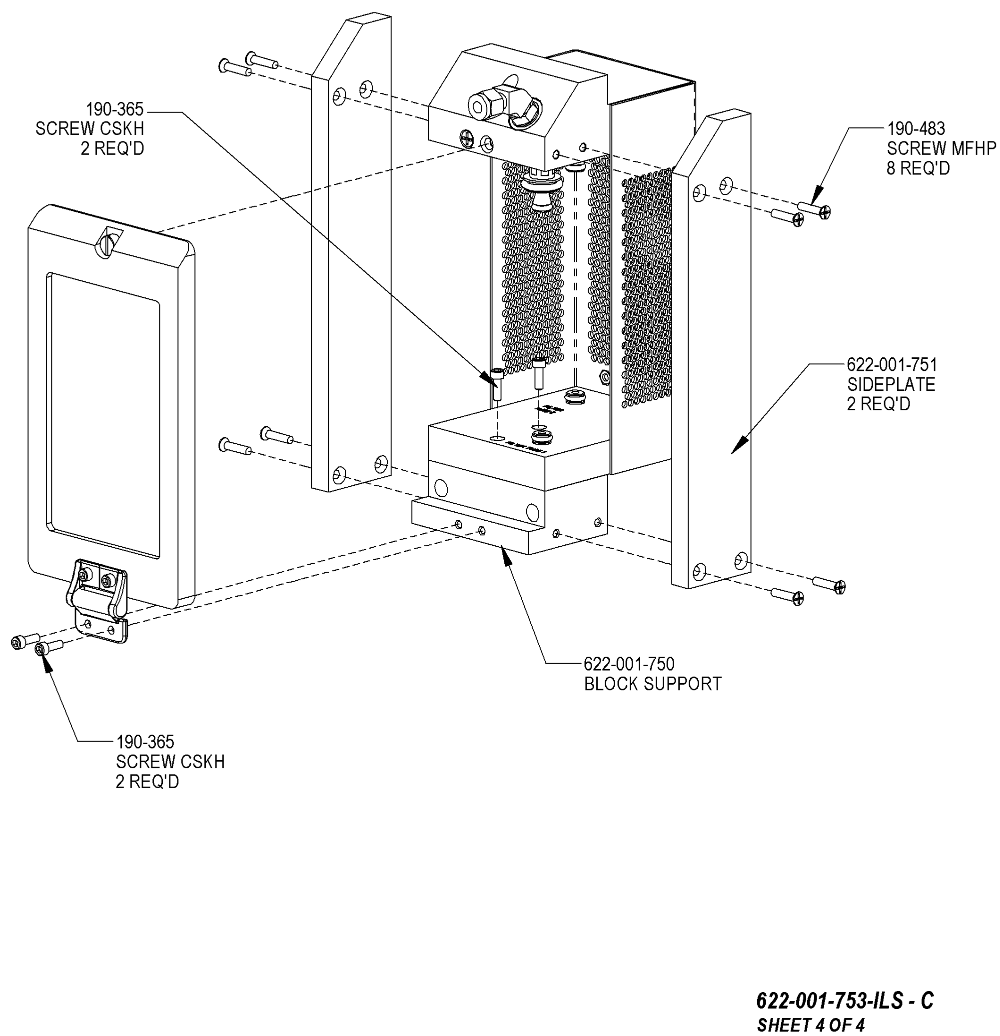


Figure 10-19
Manifold Tube Filter Upper .25 Furnace Exh Assy 4 of 4

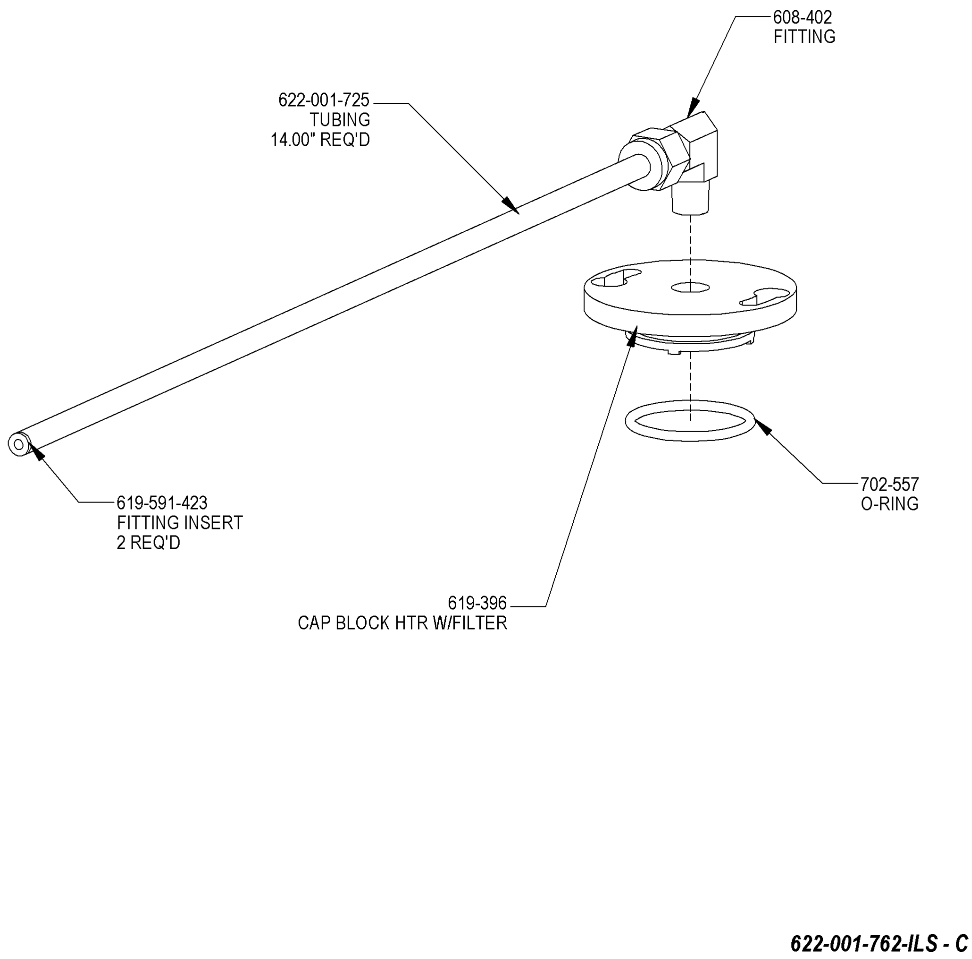


Figure 10-20
Tube Exit Furnace .25 Assembly

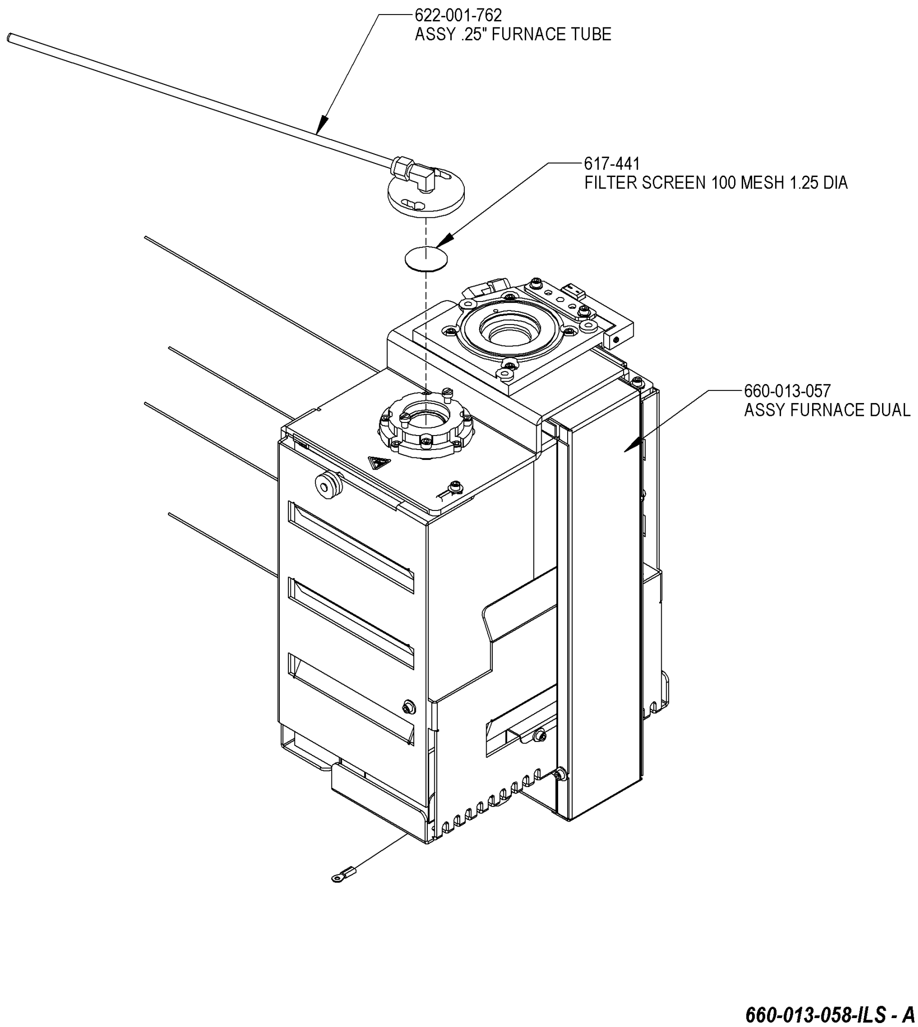


Figure 10-21
Dual Furnace w/Cap $^1/_4$ Tube Assembly

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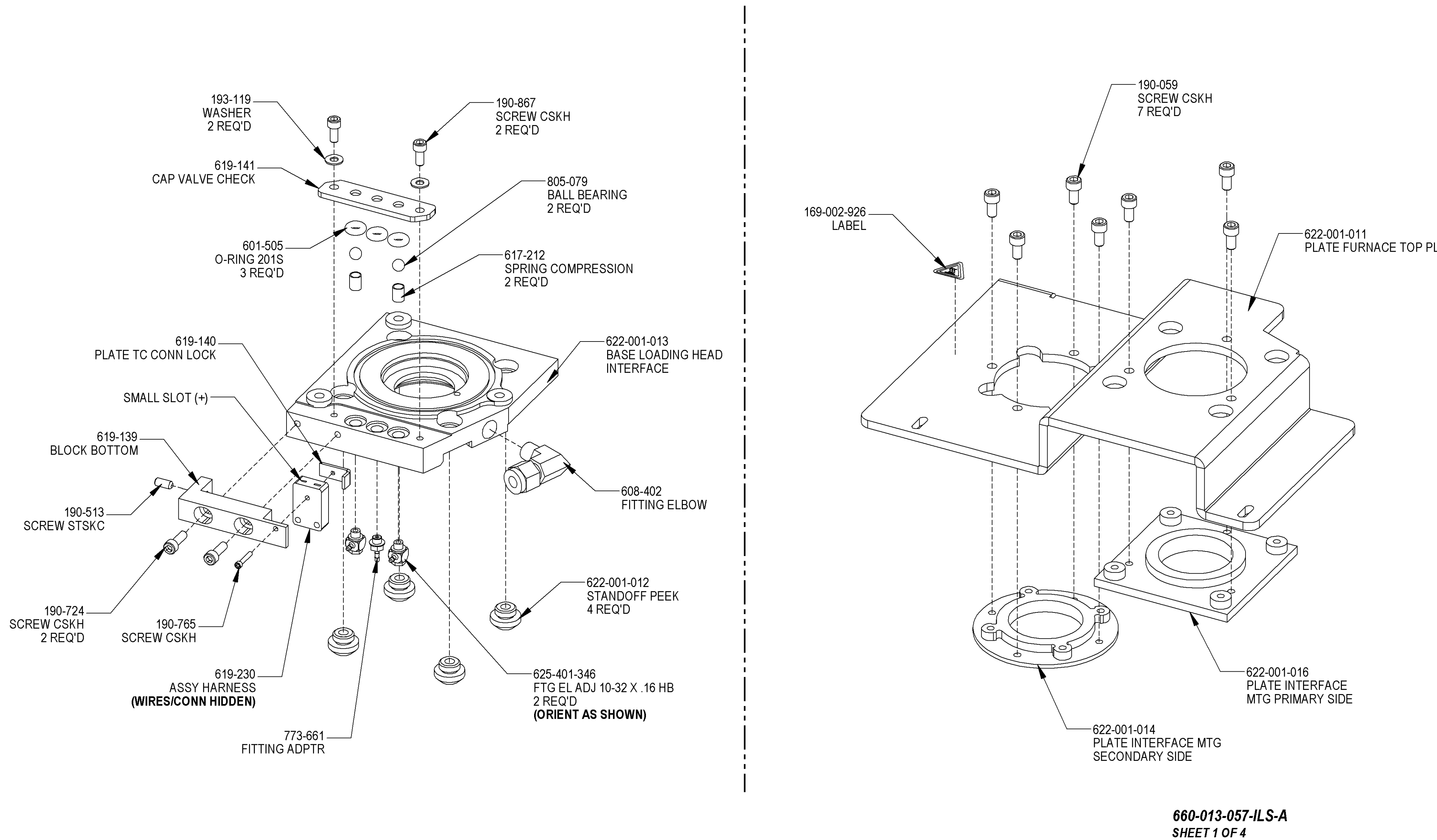

Figure 10-22
Top Furnace Plate Assembly

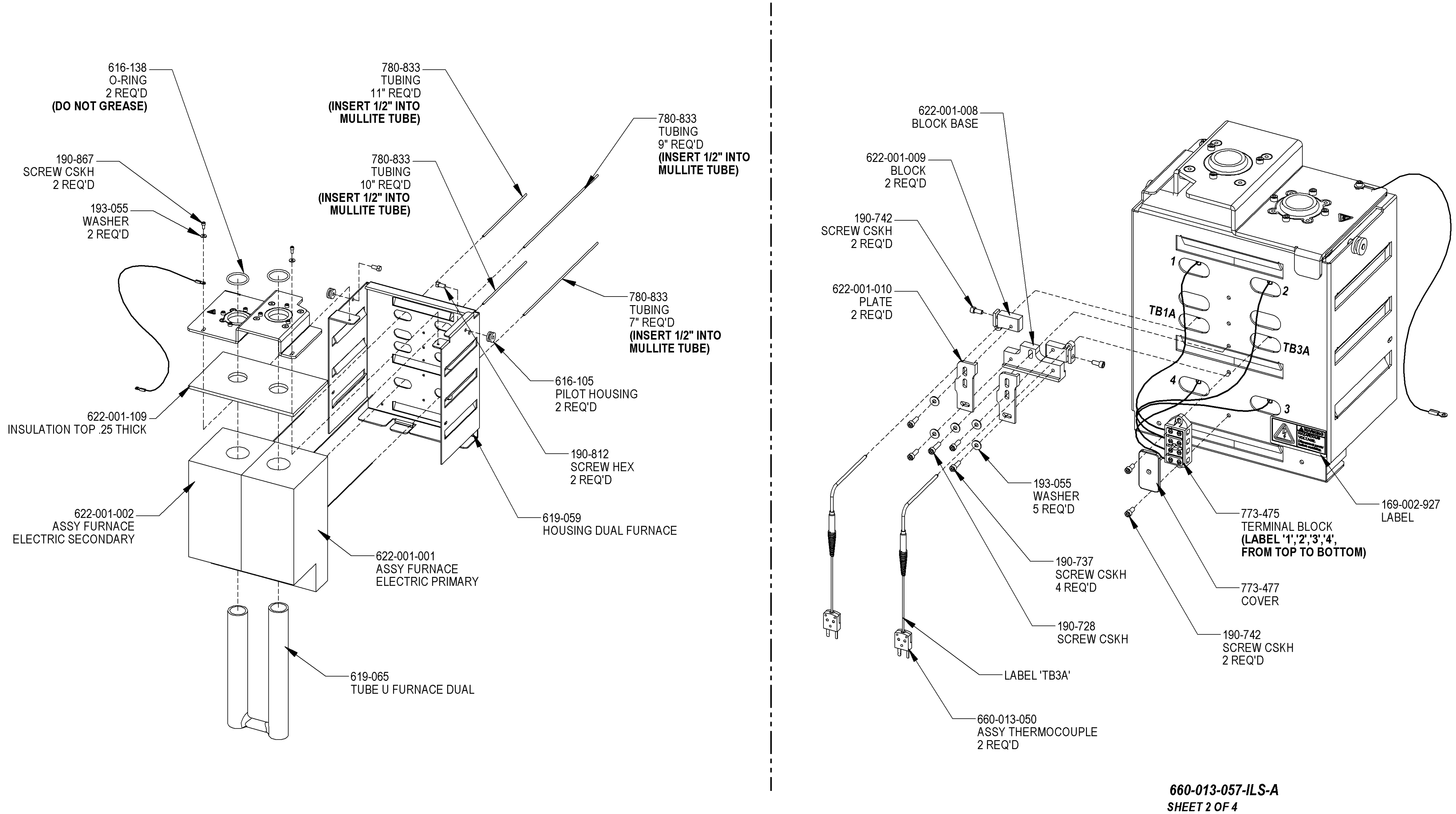

Figure 10-23
Primary/Secondary Electric Furnace Assembly

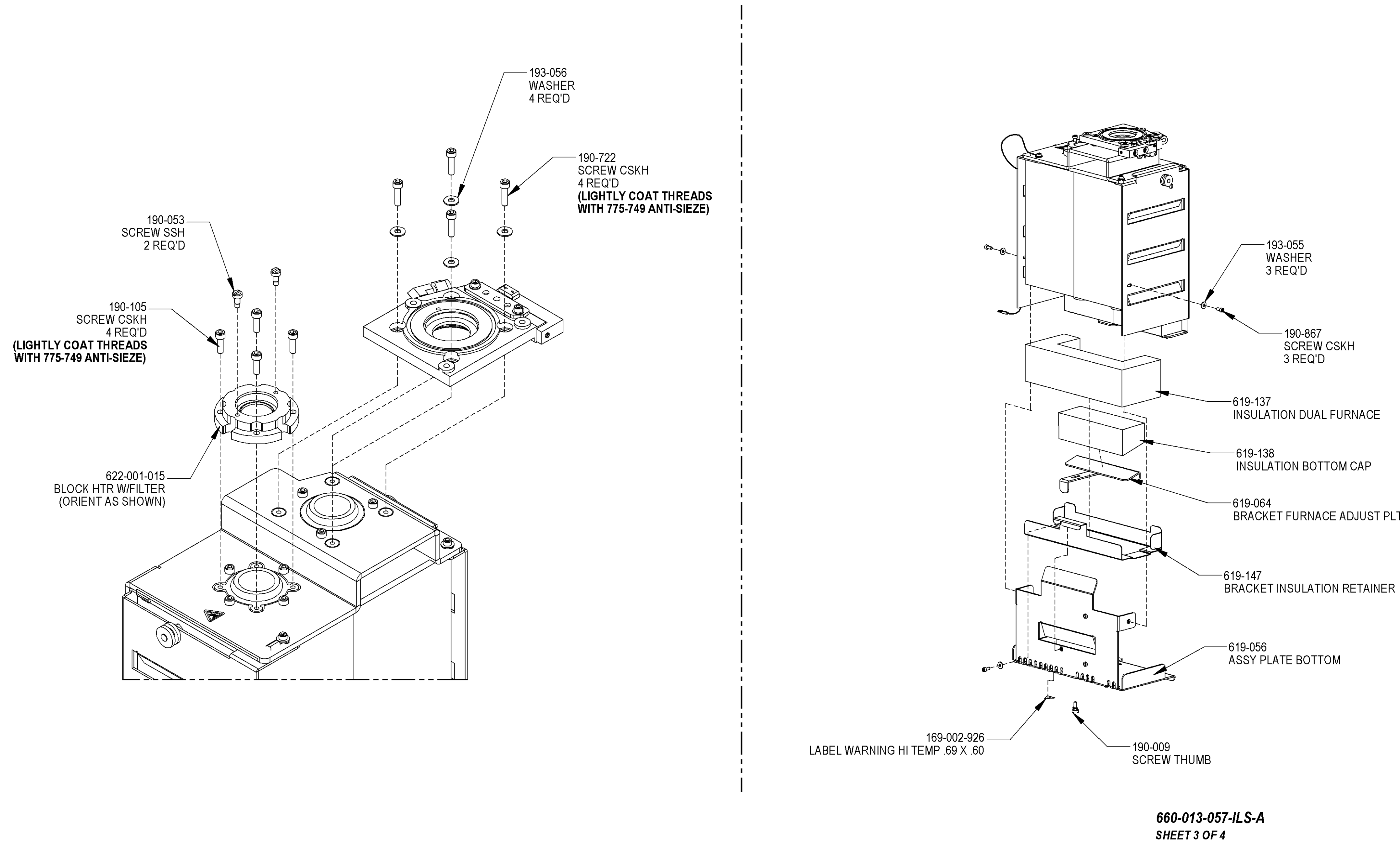

Figure 10-24
Primary/Secondary Elec Furnace Bottom Plate Assembly

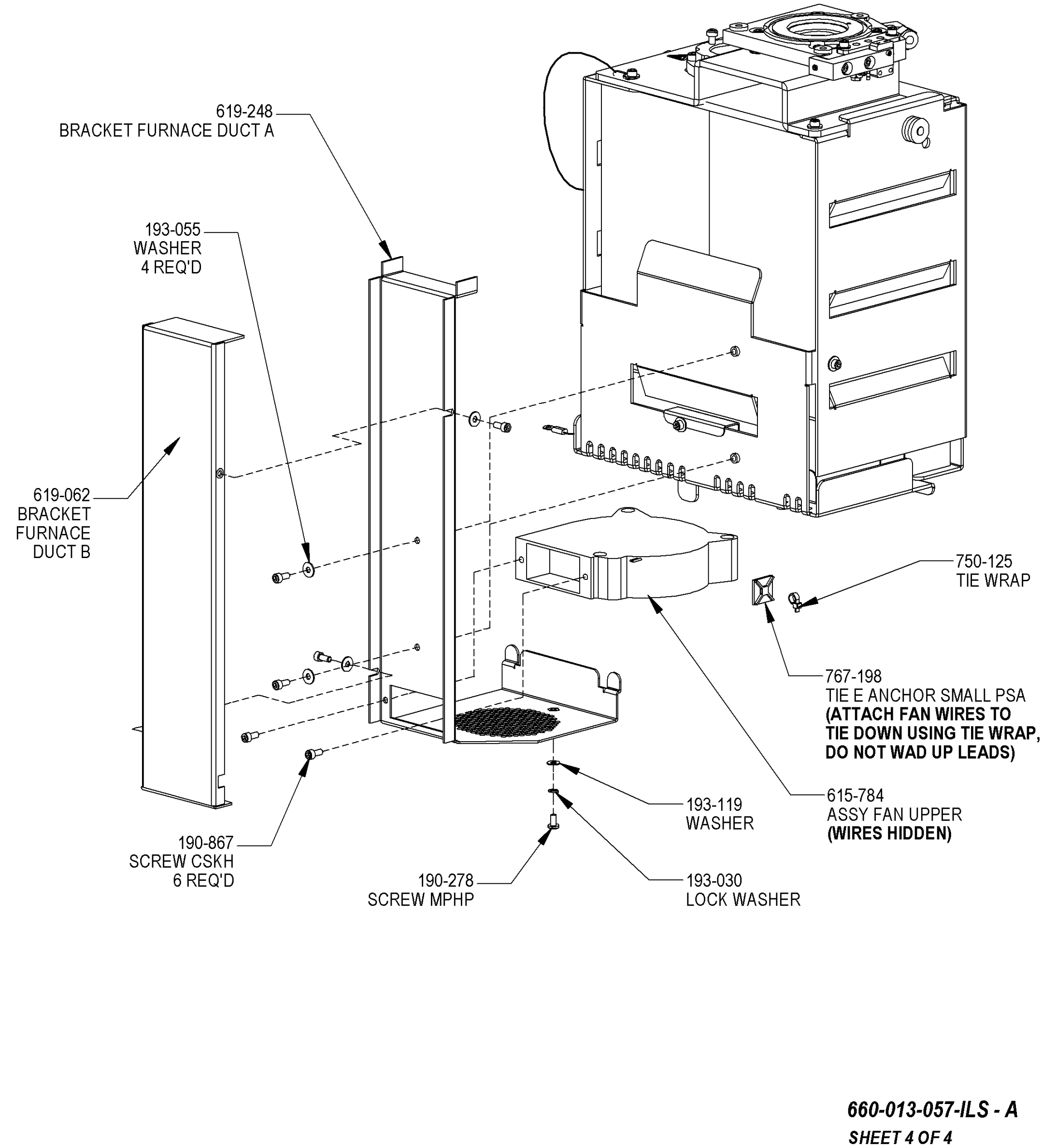

Figure 10-25
Dual Furnace Assembly

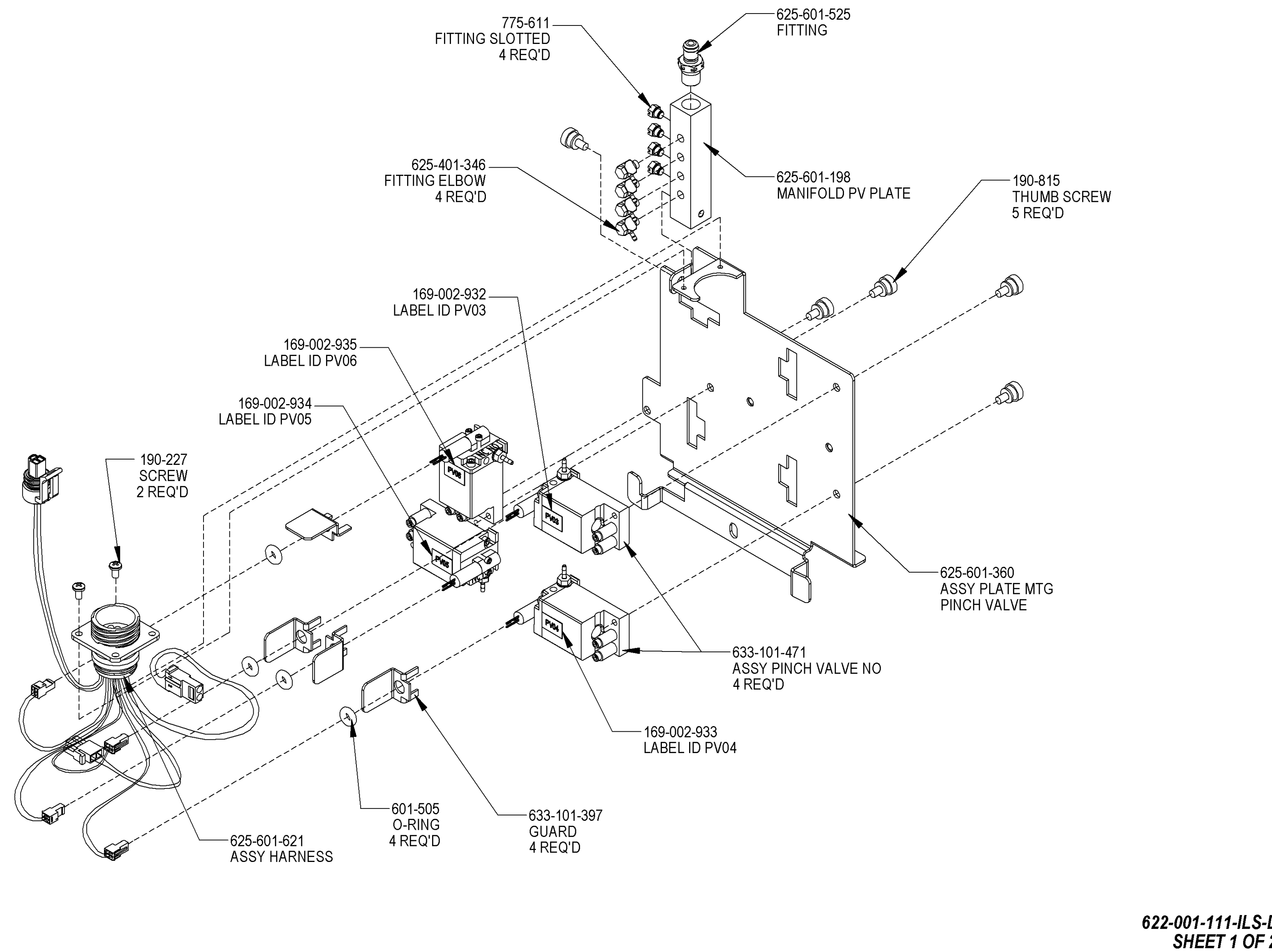

Figure 10-26
Pinch Valve Plate Assembly

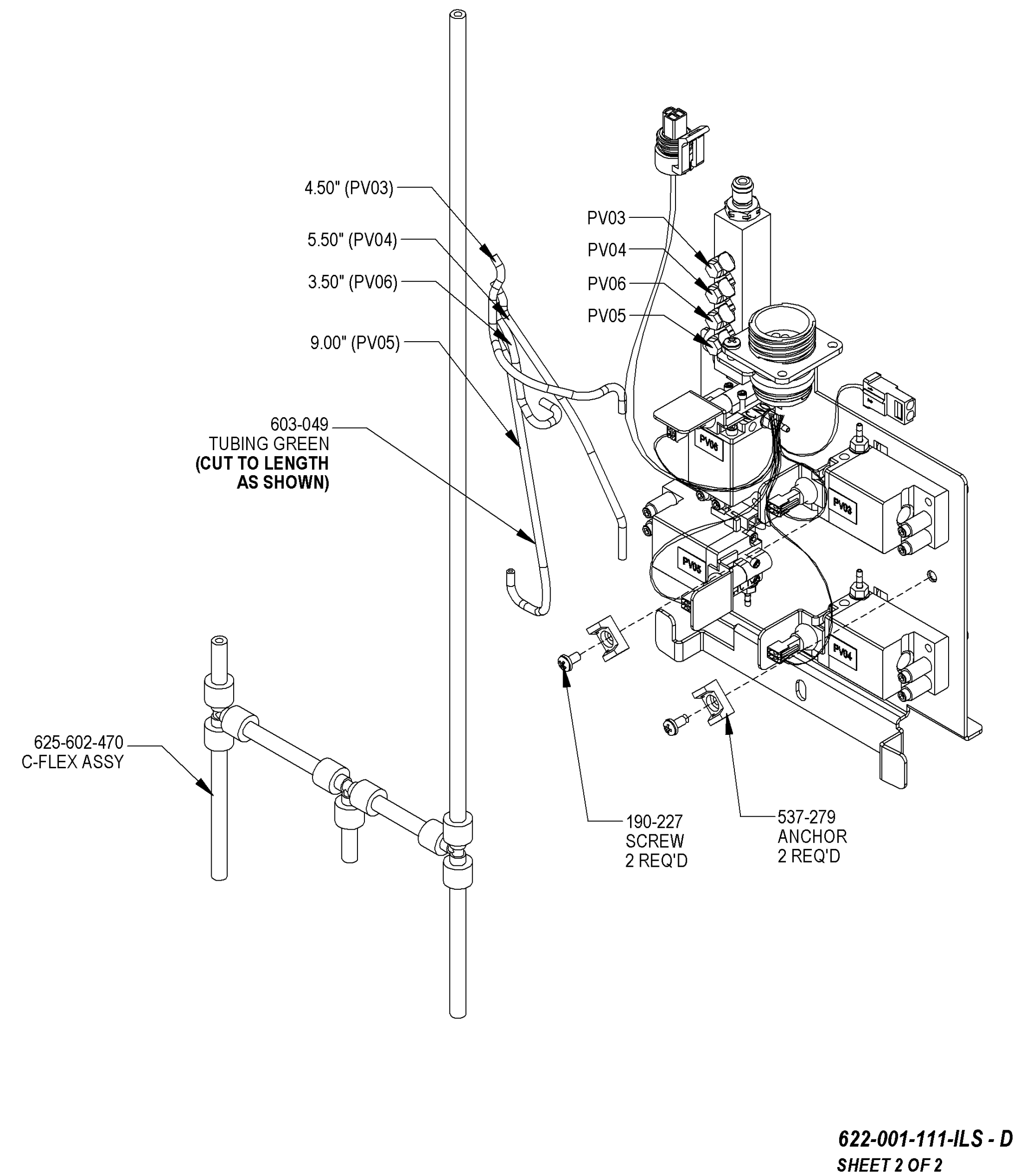

Figure 10-27
Pinch Valve Electrical Assembly

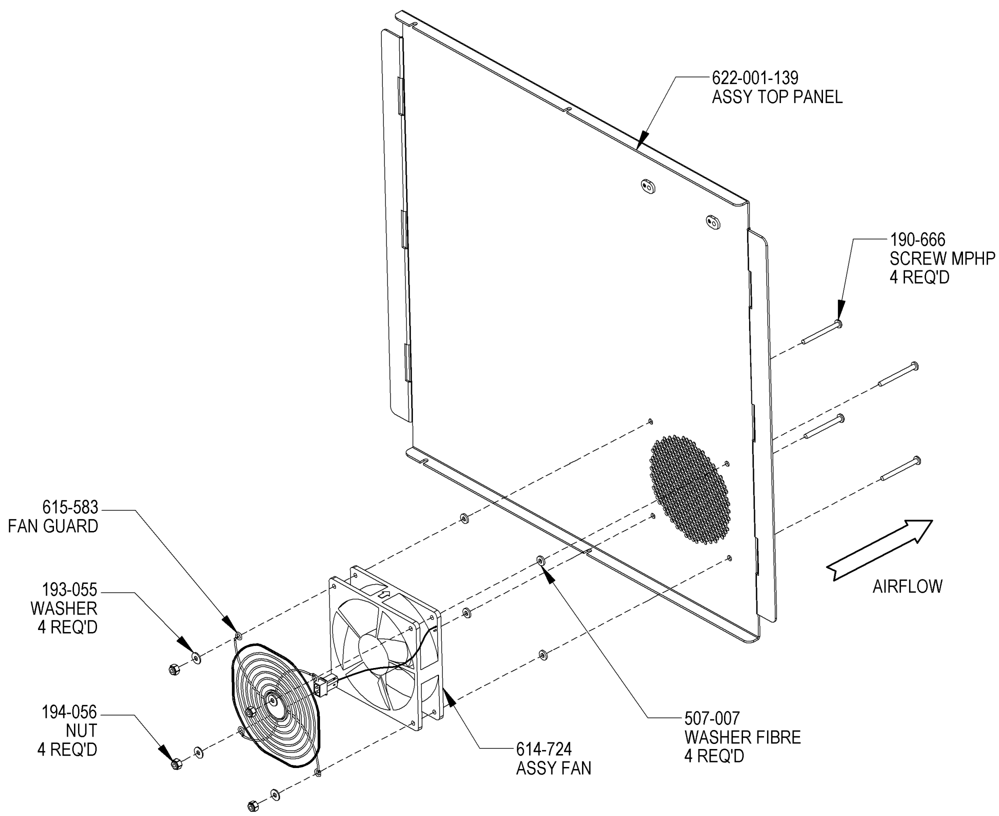

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Figure 10-28
Top Panel Assembly

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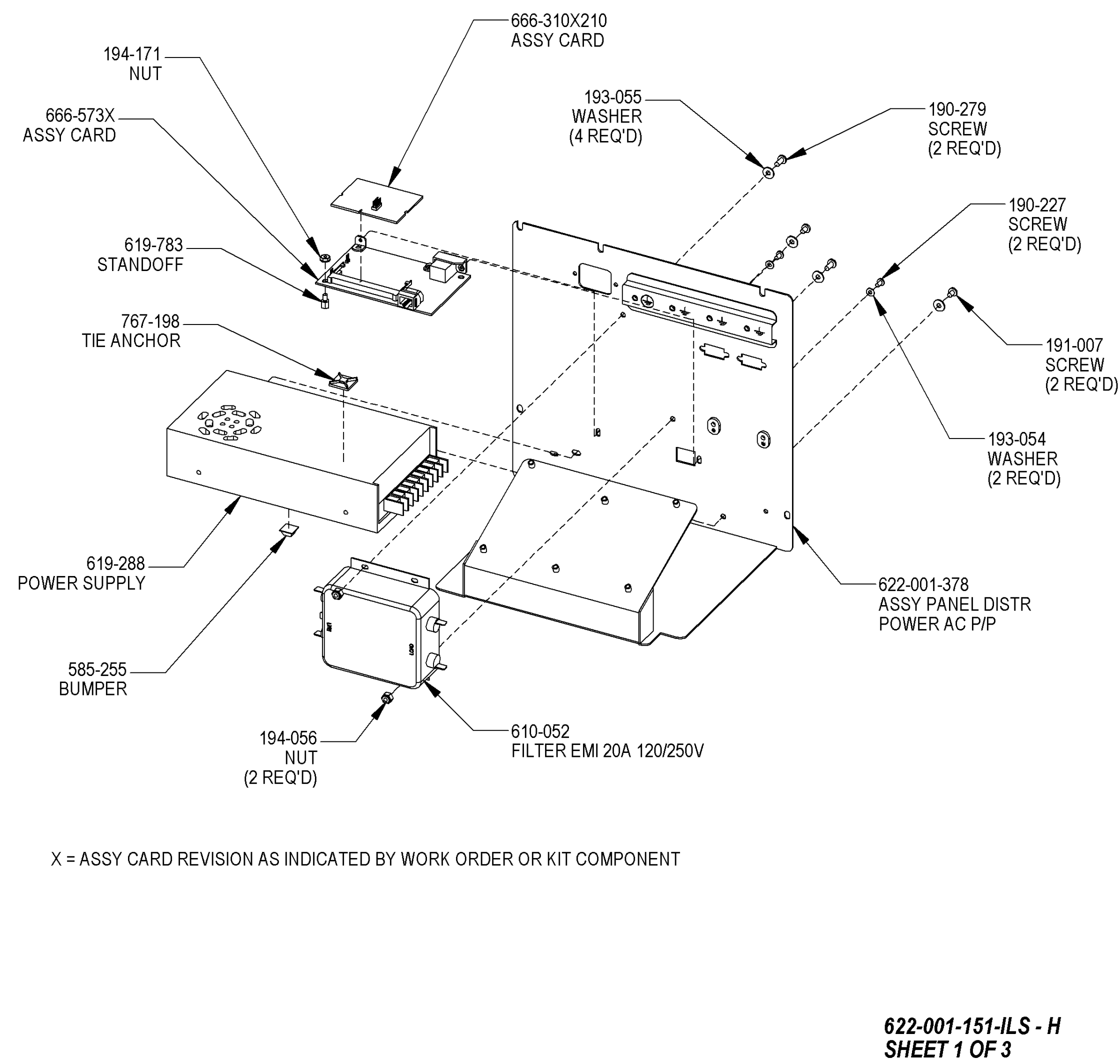


Figure 10-29
Power Distribution Panel Assembly

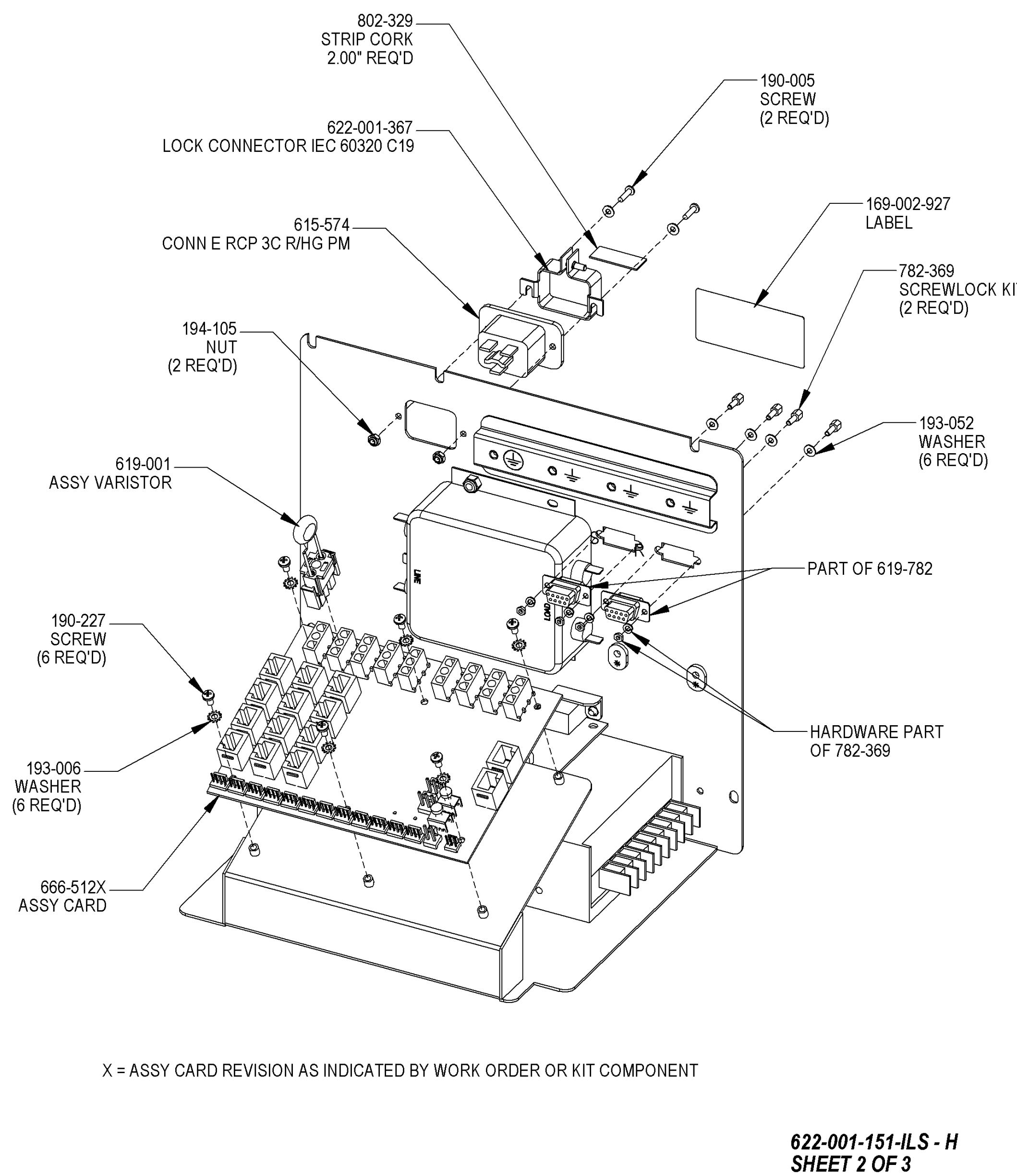
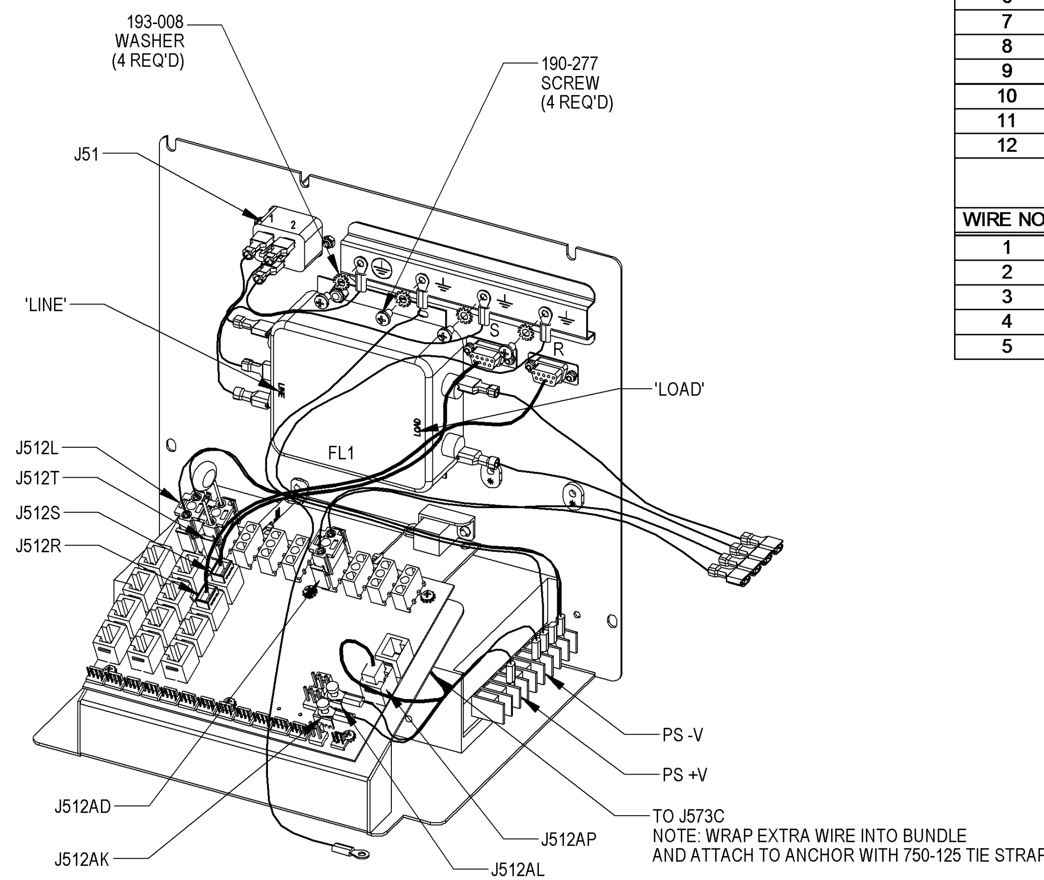


Figure 10-30
Power Distribution Panel Card Assembly



INSTALL 619-318 HARNESS AS FOLLOWS:			
WIRE NO.	COLOR	FROM	TO
1	WHITE	J51-AC1 (L)	FL1-LINE 1
2	WHITE	J51-AC2 (N)	FL1-LINE 2
3	GRN/YEL	J51-GND	CHASSIS GROUND
4	GRN/YEL	FL1-GND	CHASSIS GROUND
5	WHITE	FL1-LOAD 1	*CB1-LINE 1
6	WHITE	FL1-LOAD 2	*CB1-LINE 2
7	WHITE	PS-L	J512L
8	WHITE	PS-N	J512L
9	GRN/YEL	PS-G	CHASSIS GROUND
10	WHITE	*CB1-LOAD 1	J512AD
11	WHITE	*CB1-LOAD 2	J512AD
12	GRN/YEL	CHASSIS GROUND	*BASE GROUND

INSTALL 619-782 HARNESS AS FOLLOWS:			
WIRE NO.	COLOR	FROM	TO
1	WHITE	J512AL	PS +V-2
2	WHITE	J512AK	PS -V-5
3	RED	J512AP	J573C
4	RED	J512R	ECLIPSE INTER RIGHT
5	RED	J512S	ECLIPSE INTER LEFT

622-001-151-ILS-H
SHEET 3 OF 3

Figure 10-31
Power Distribution Panel Wiring Harness Assembly

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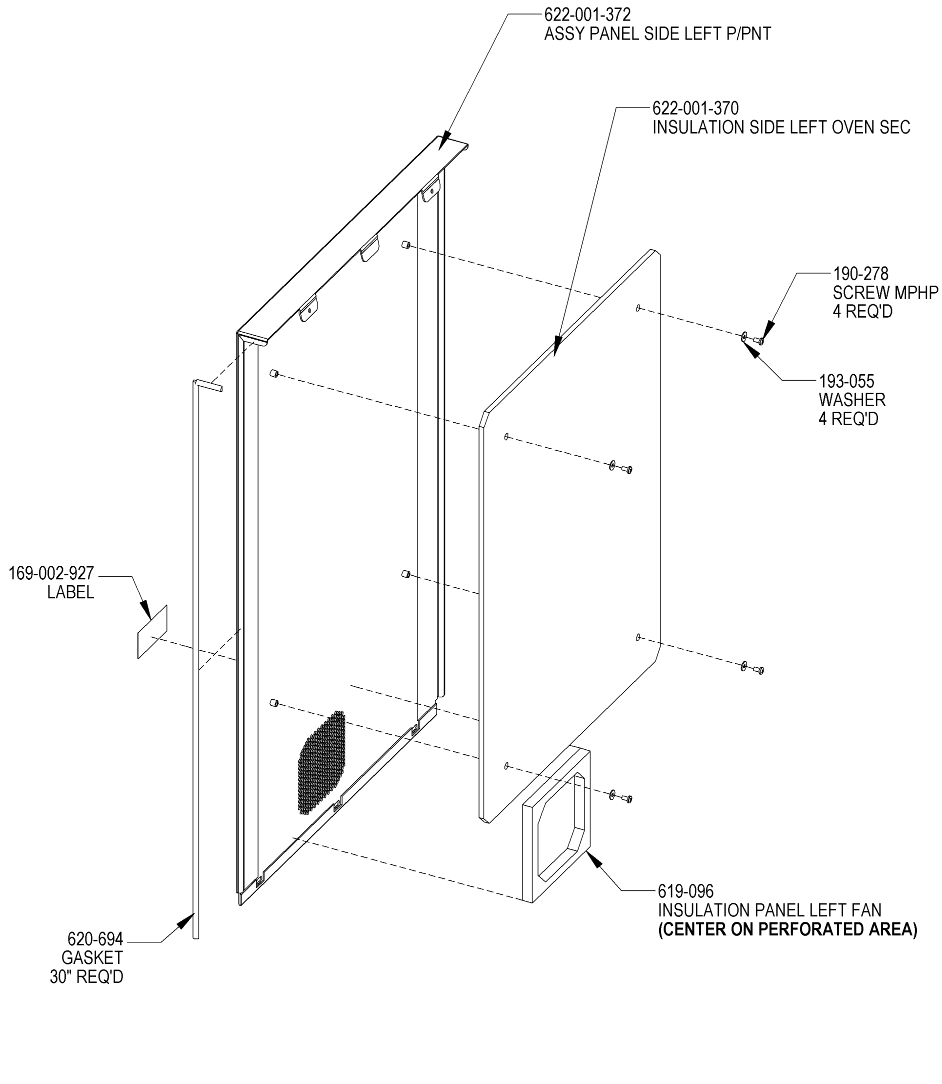


Figure 10-32
Left Side Panel Assembly

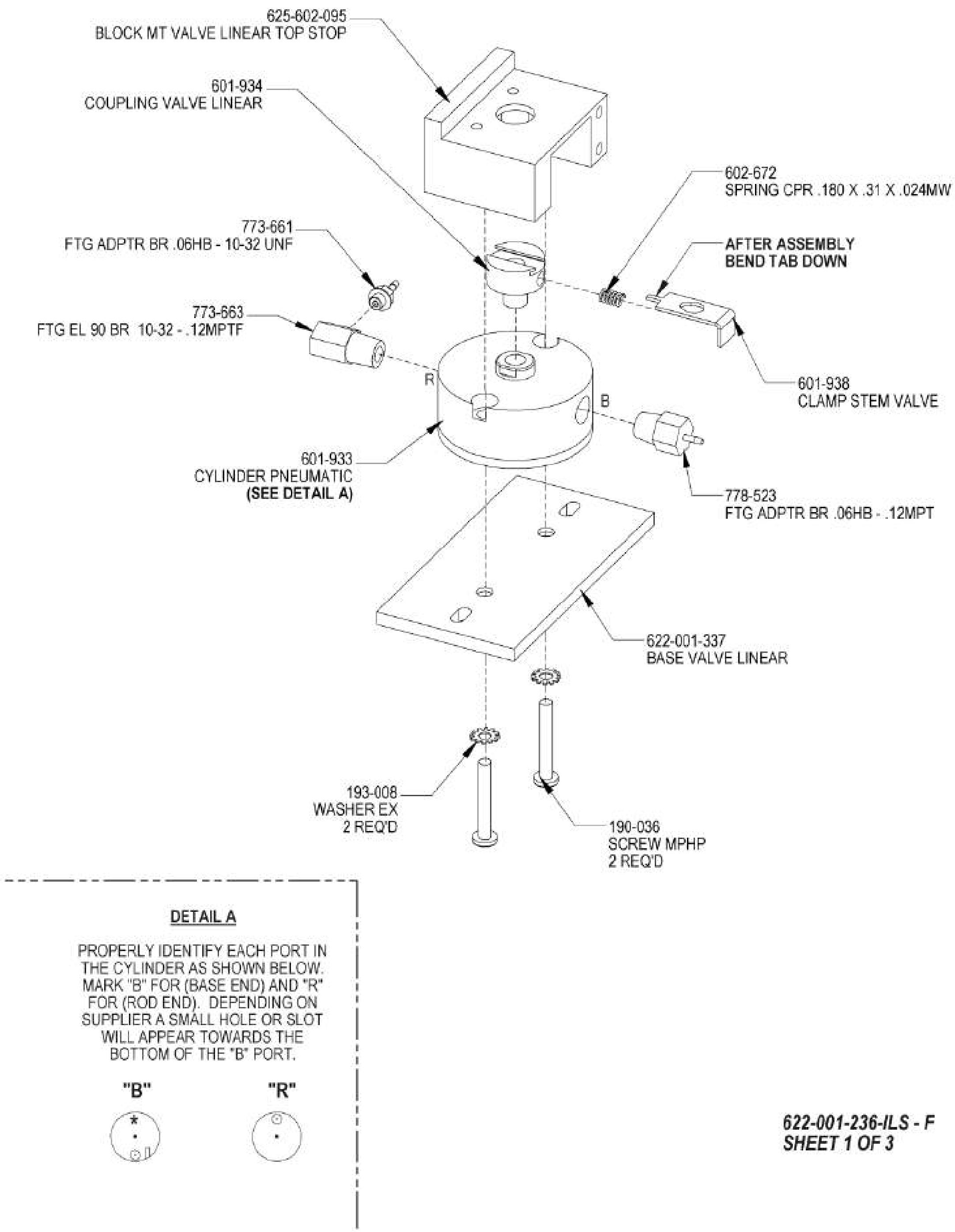


Figure 10-33
Dosing Valve Pneumatic Cylinder Assembly

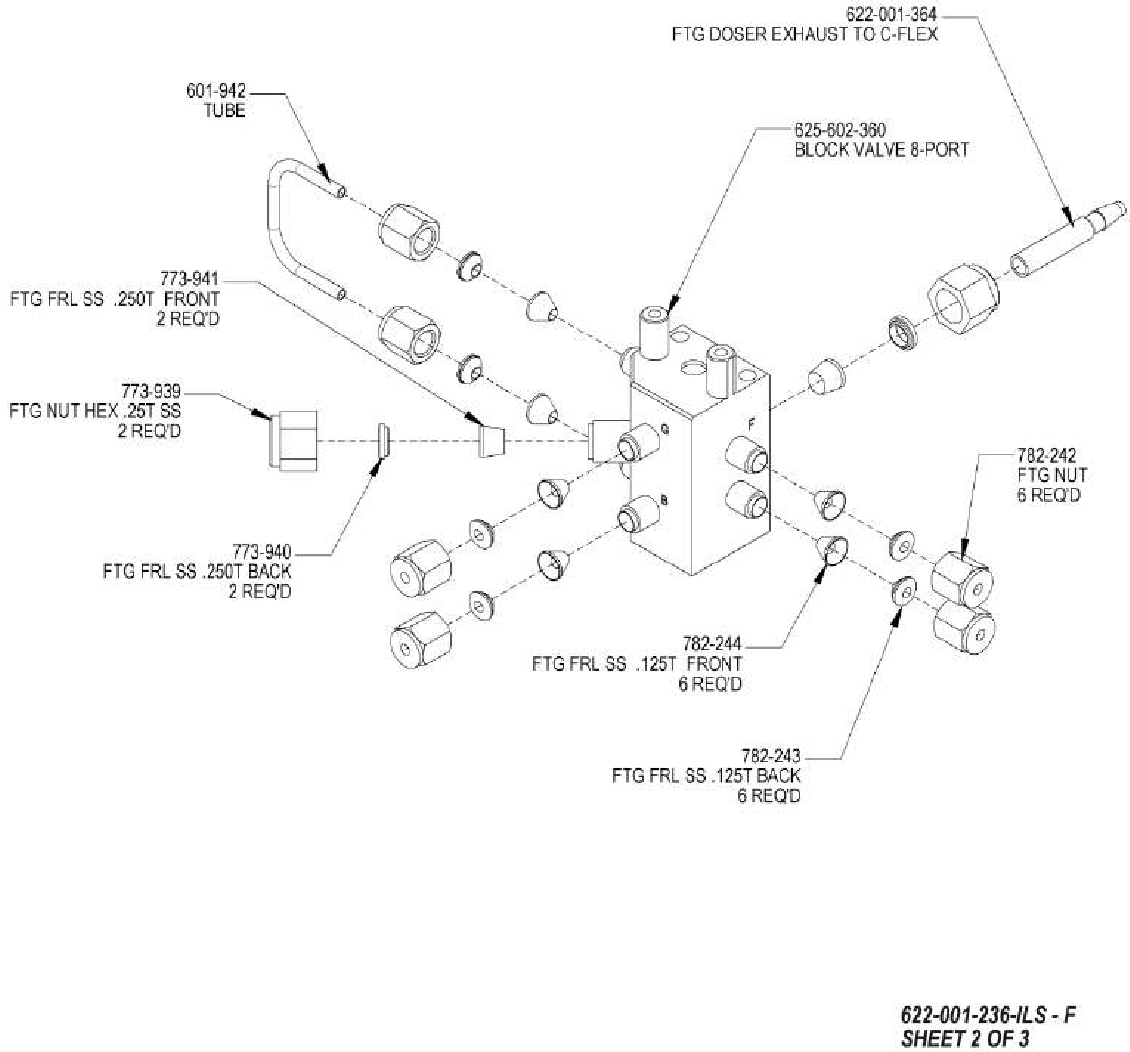
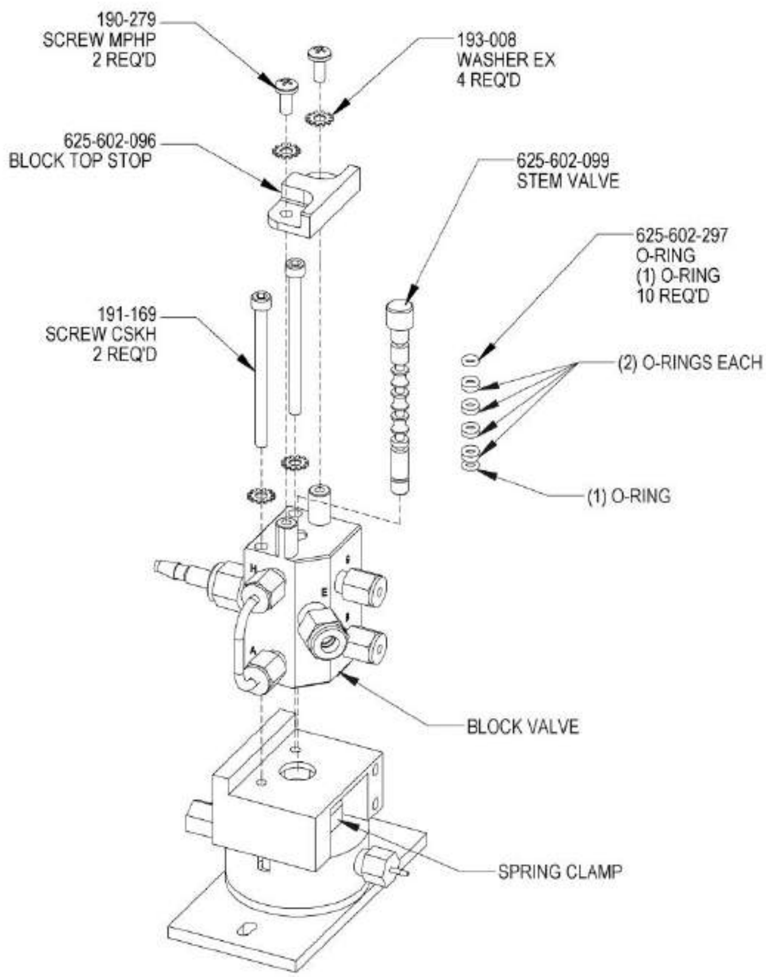


Figure 10-34
Dosing Valve 8-Port Valve Block Assembly



622-001-236-ILS - F
SHEET 3 OF 3

Figure 10-35
Dosing Valve Spring Clamp Assembly

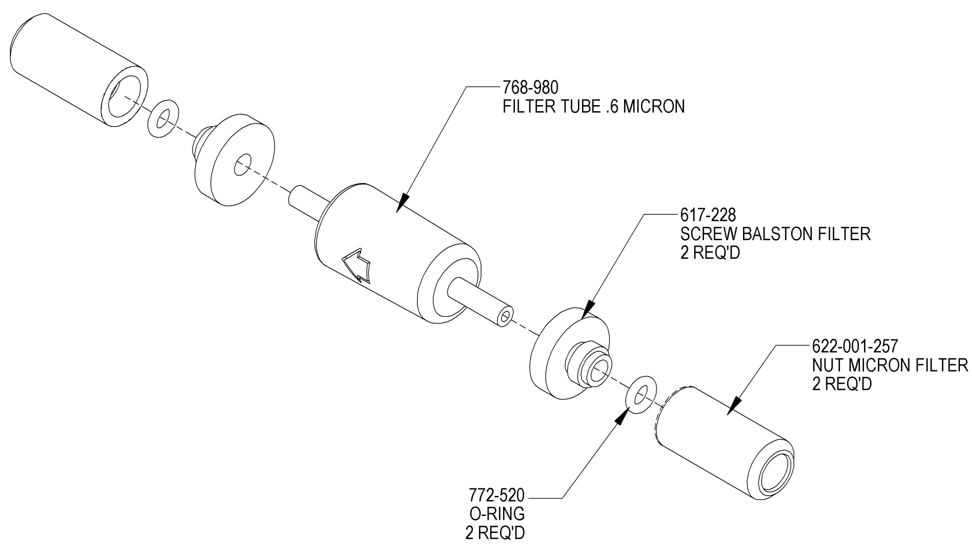


Figure 10-36
Micron Filter Assembly

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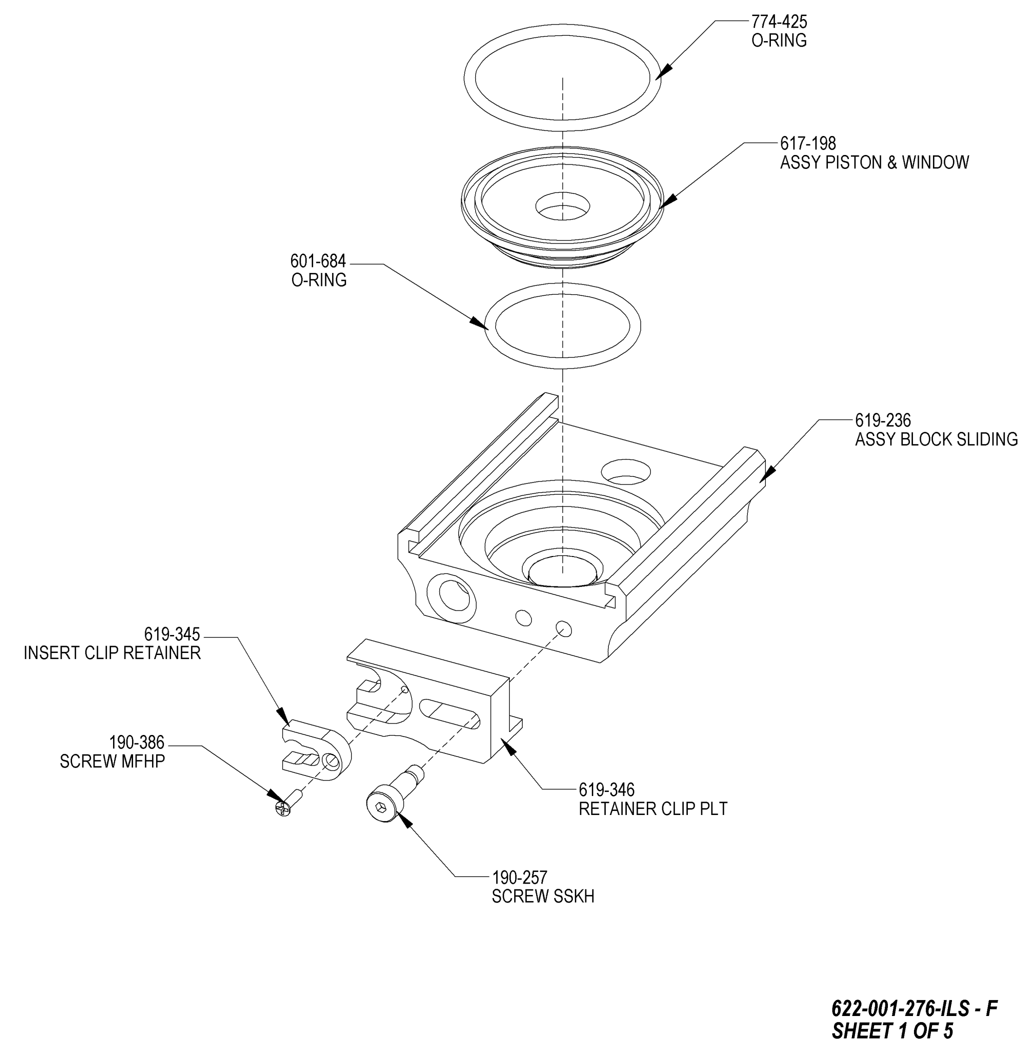
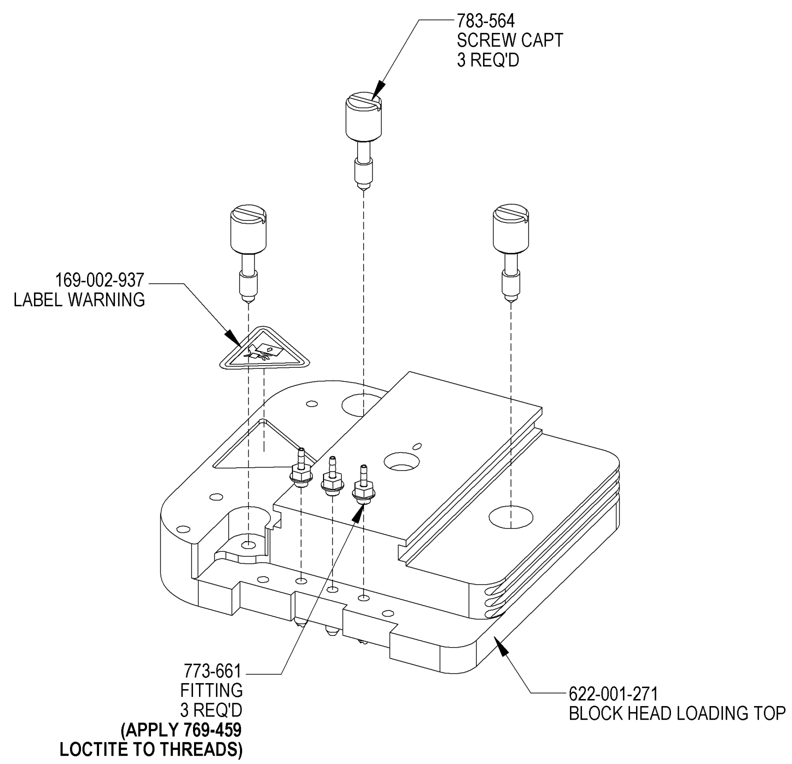
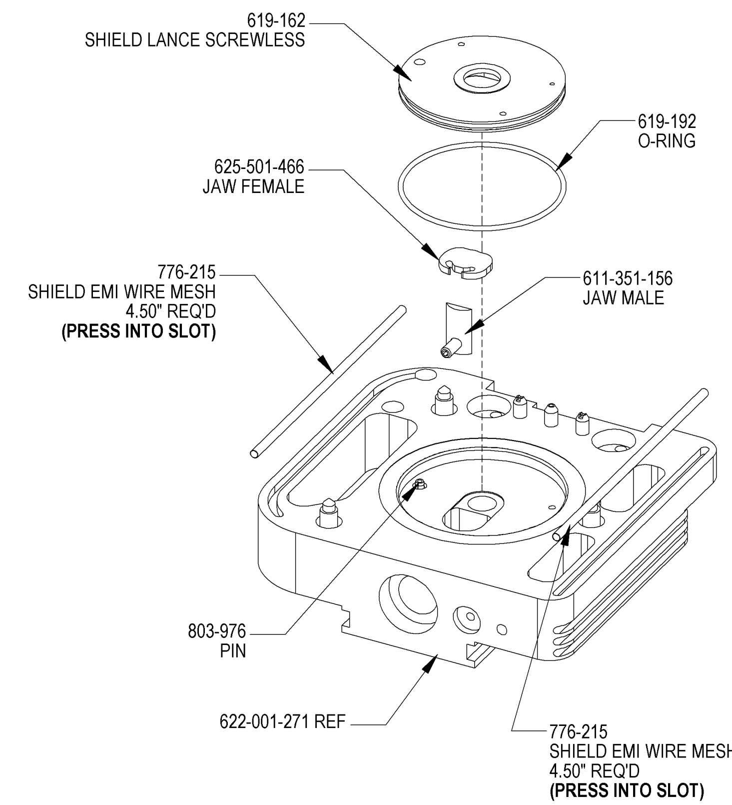


Figure 10-37
Loading Head Sliding Block Assembly





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SHEET 2 OF 5

Figure 10-38
Loading Head Top Block Assembly

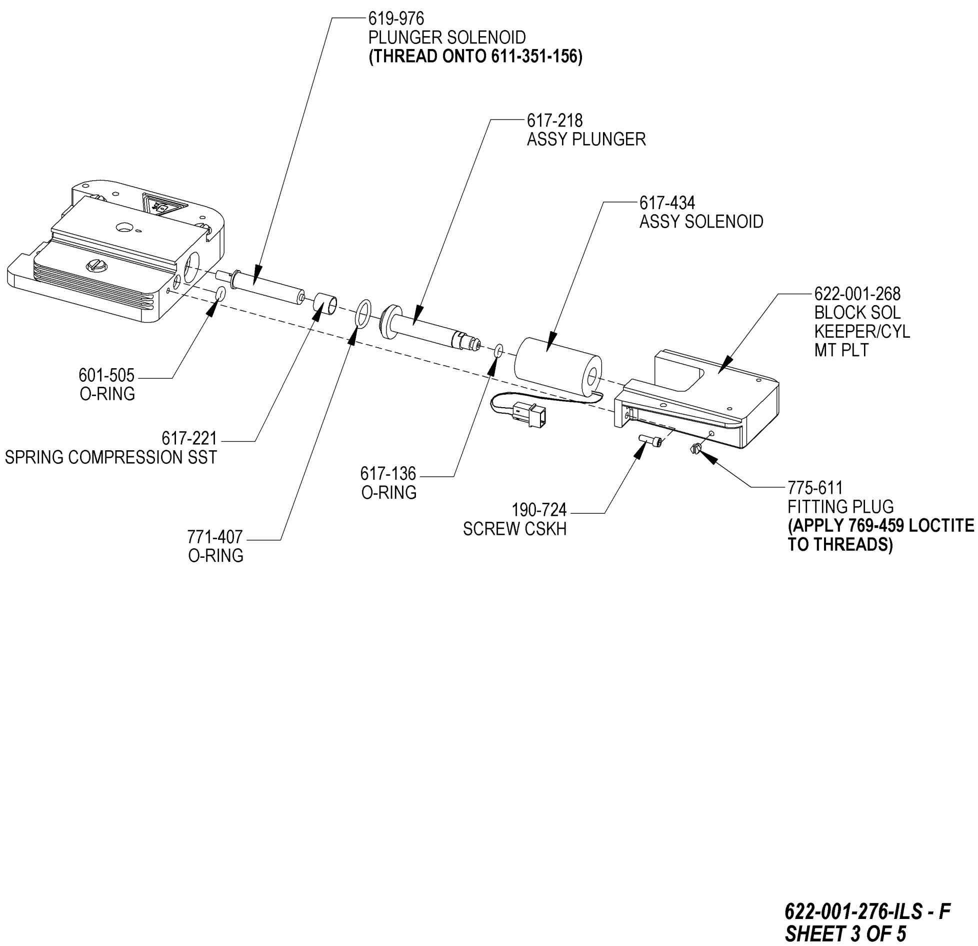


Figure 10-39
Loading Head Solenoid Assembly

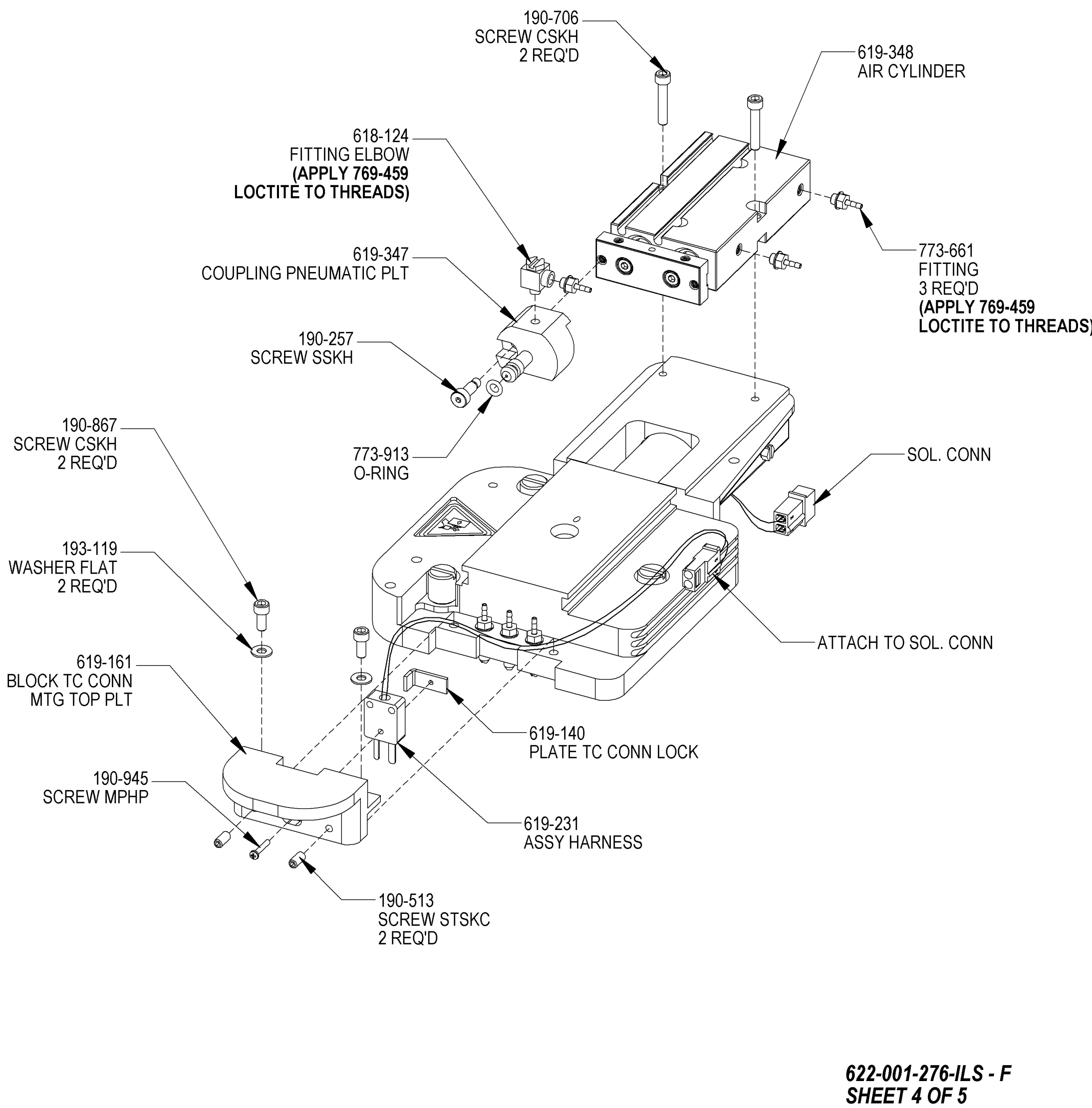


Figure 10-40
Loading Head Air Cylinder Assembly

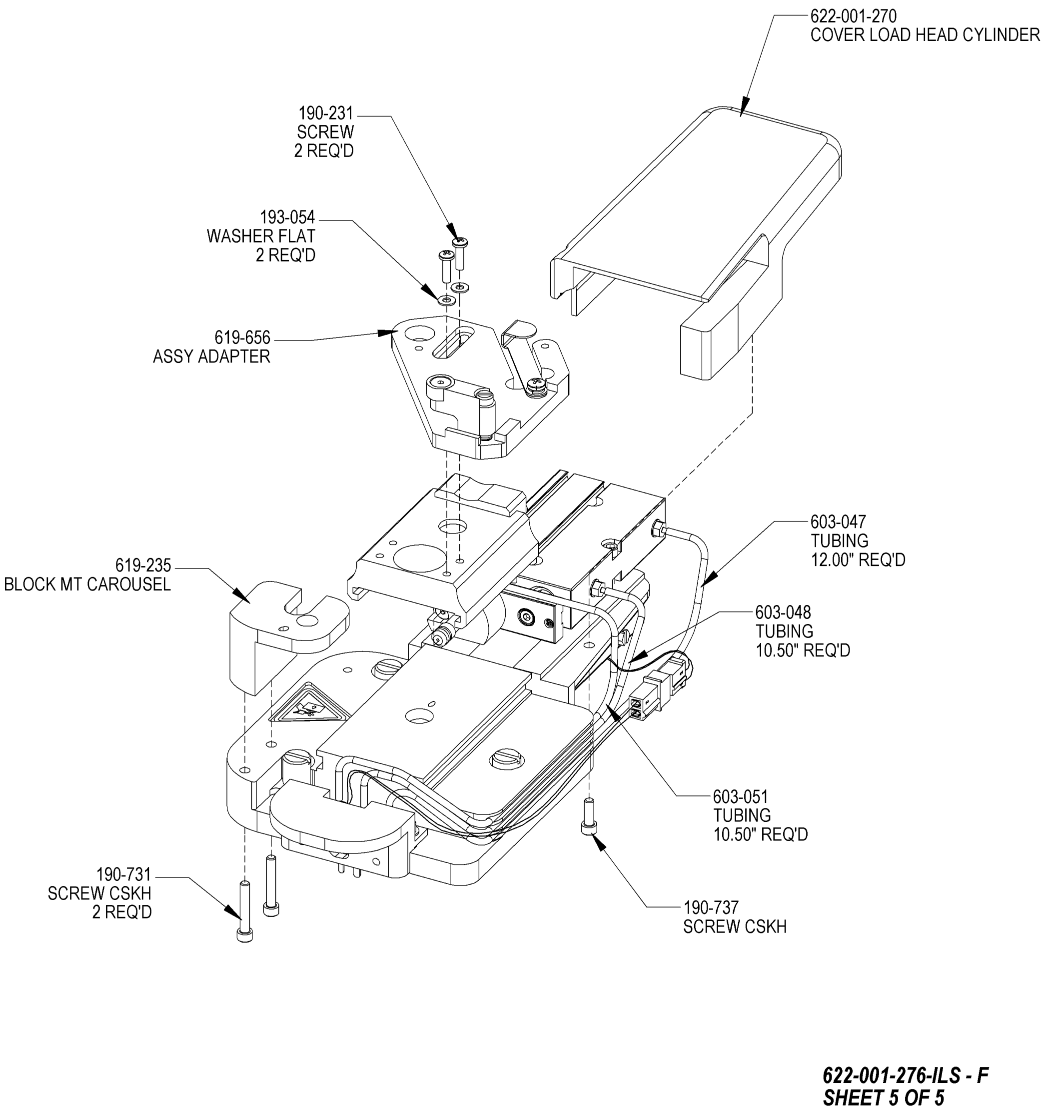
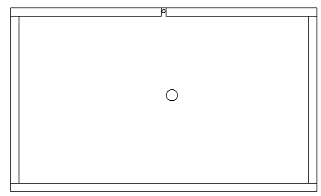
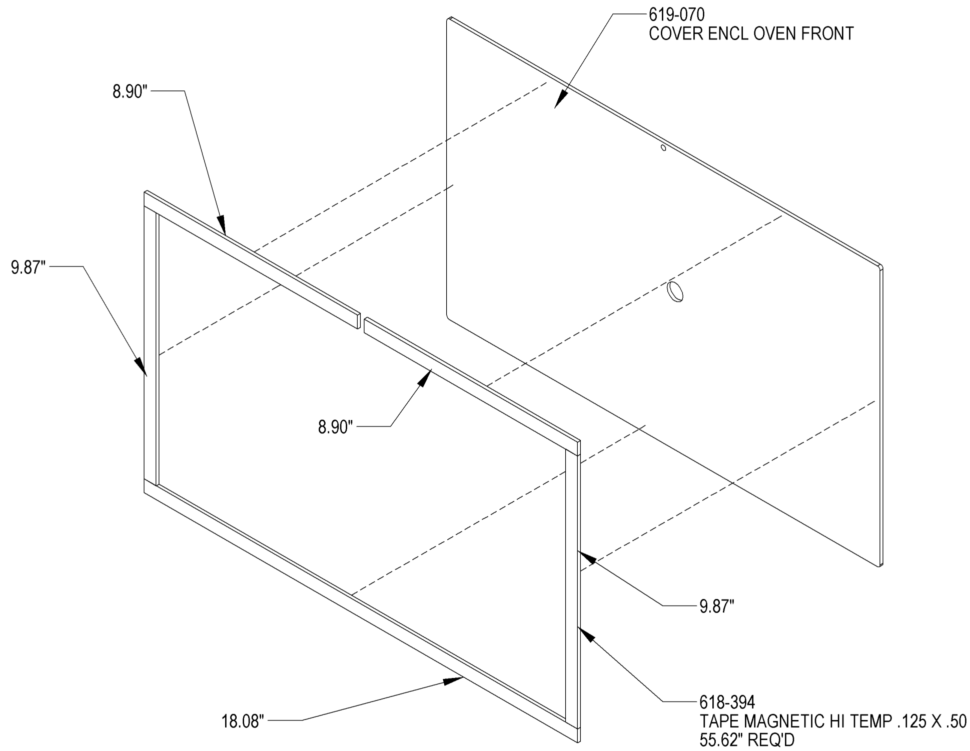


Figure 10-41
Loading Head Cylinder Cover Assembly



TAPE SHOULD APPEAR
AS ABOVE WHEN ASSEMBLED
(NOTE THE HOLES ORIENTATION)



622-001-314-ILS - A

Figure 10-42
Oven Door Assembly

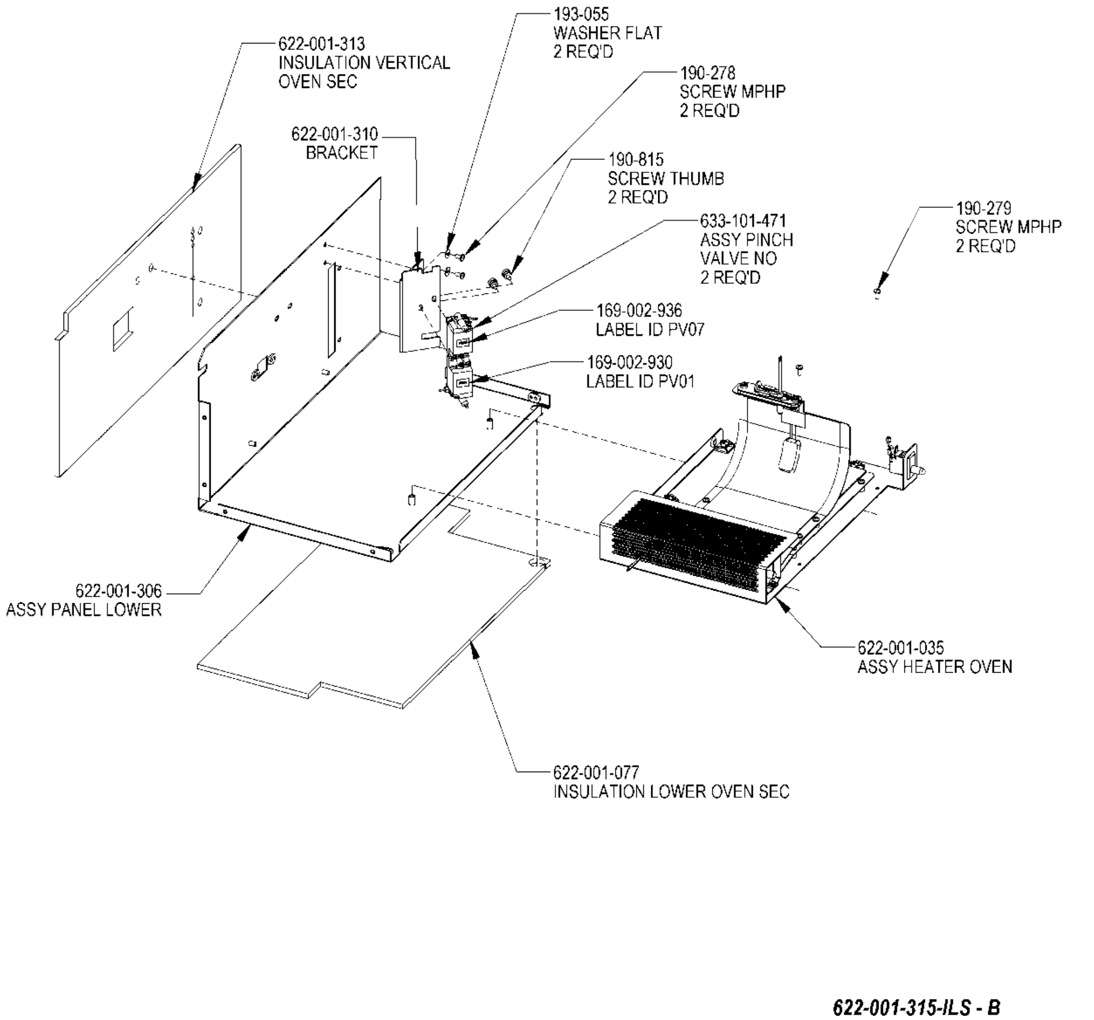


Figure 10-43
Oven Heater Shelf Assembly

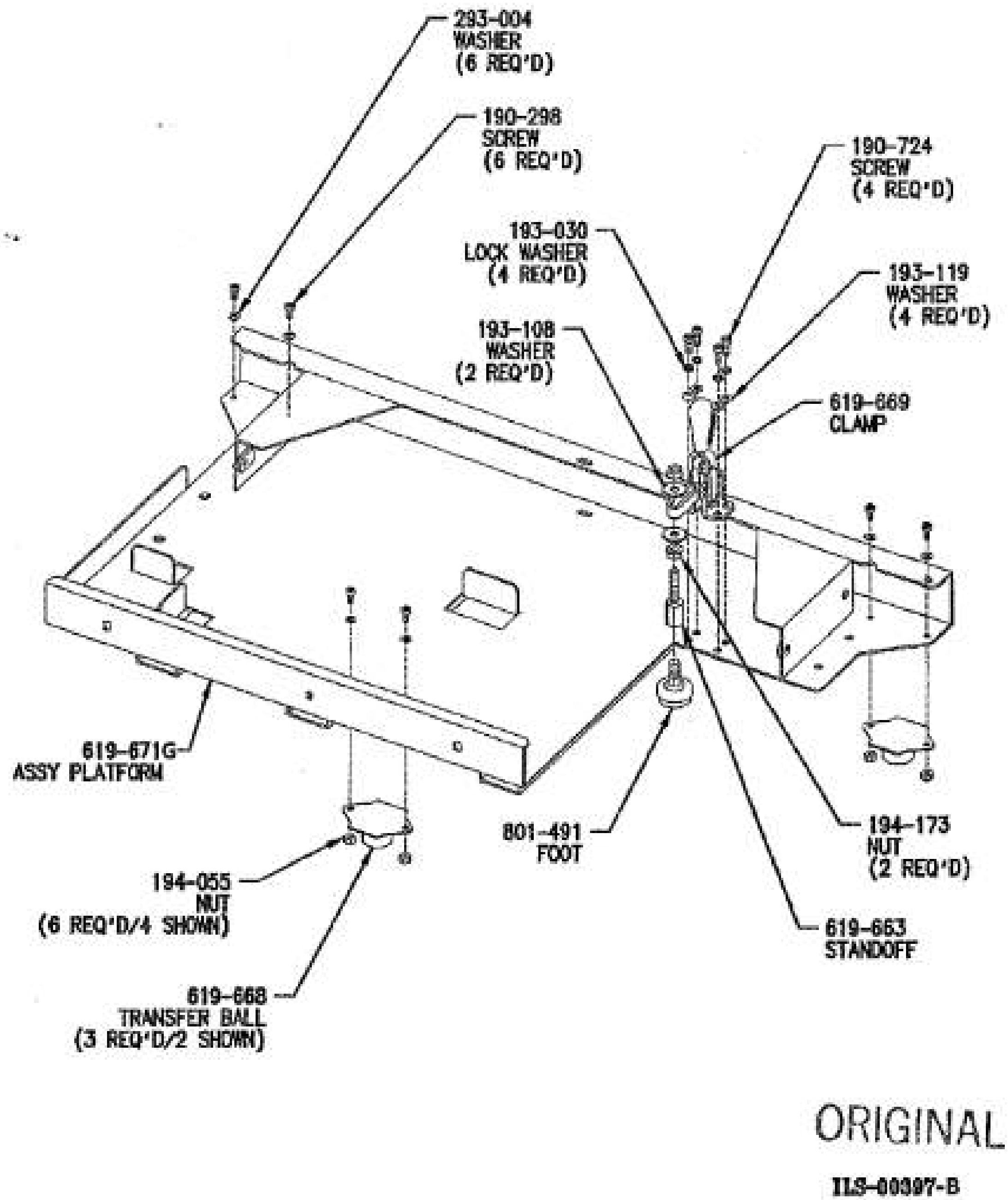


Figure 10-44
Liquid Loading Head Platform Assembly

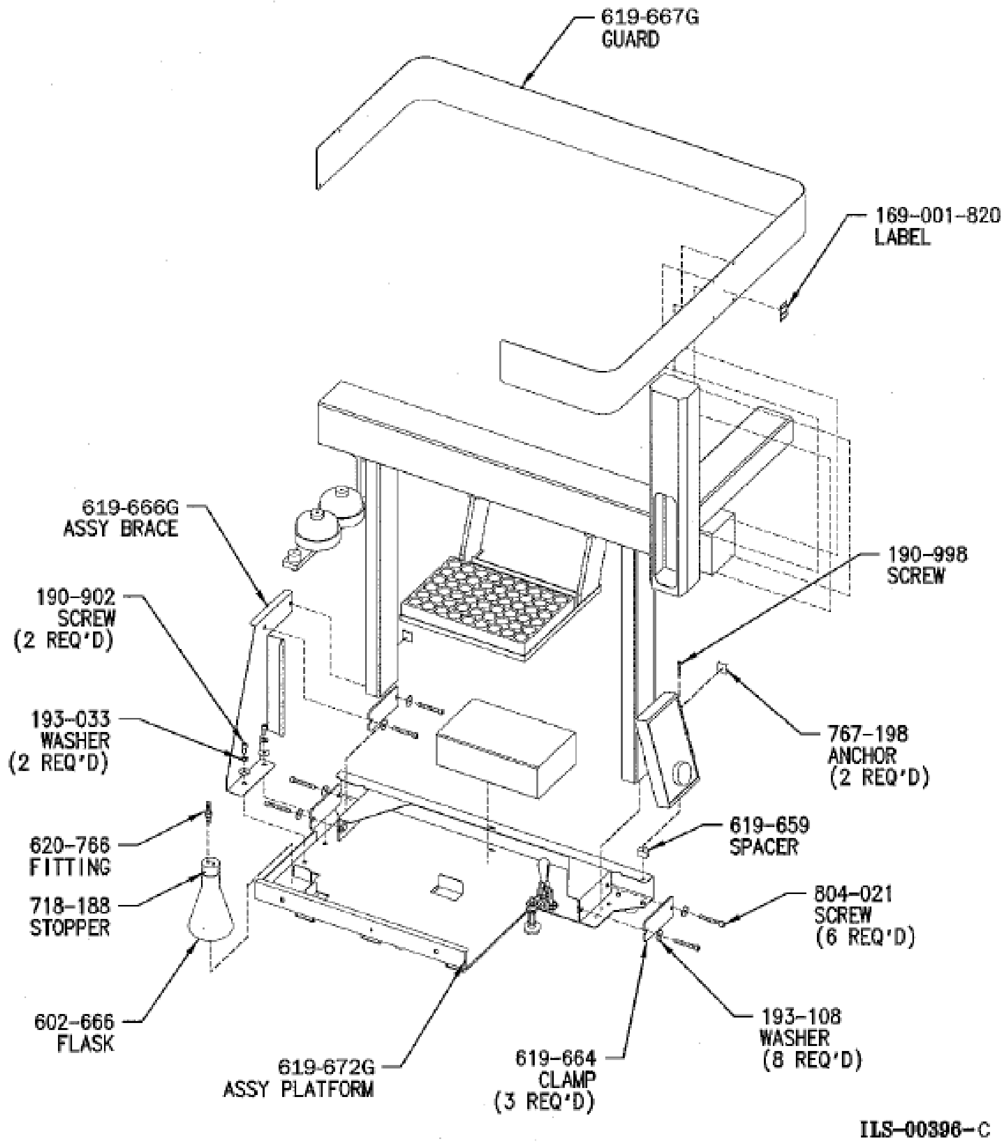


Figure 10-45
Liquid Autosampler Assembly

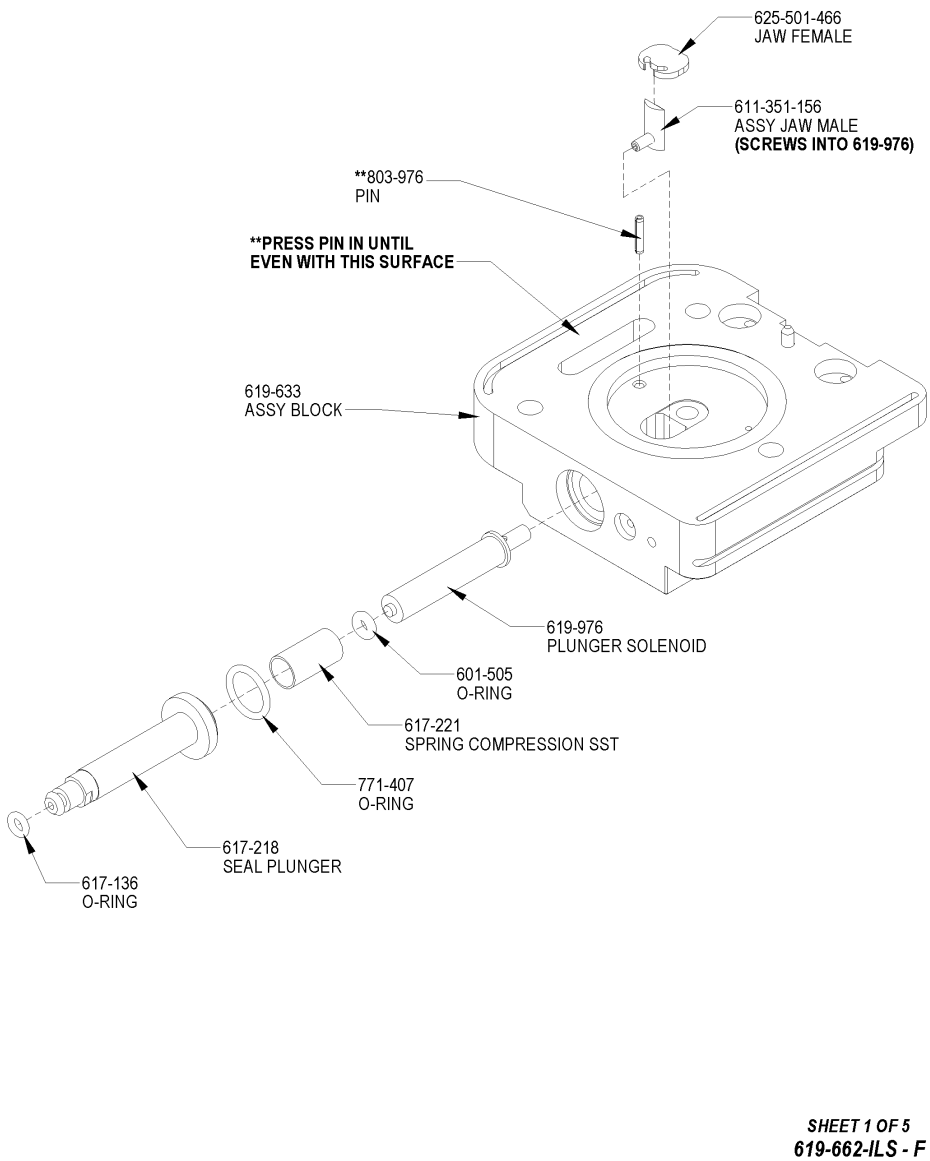


Figure 10-46
Liquid Loading Head Assembly 1 of 5

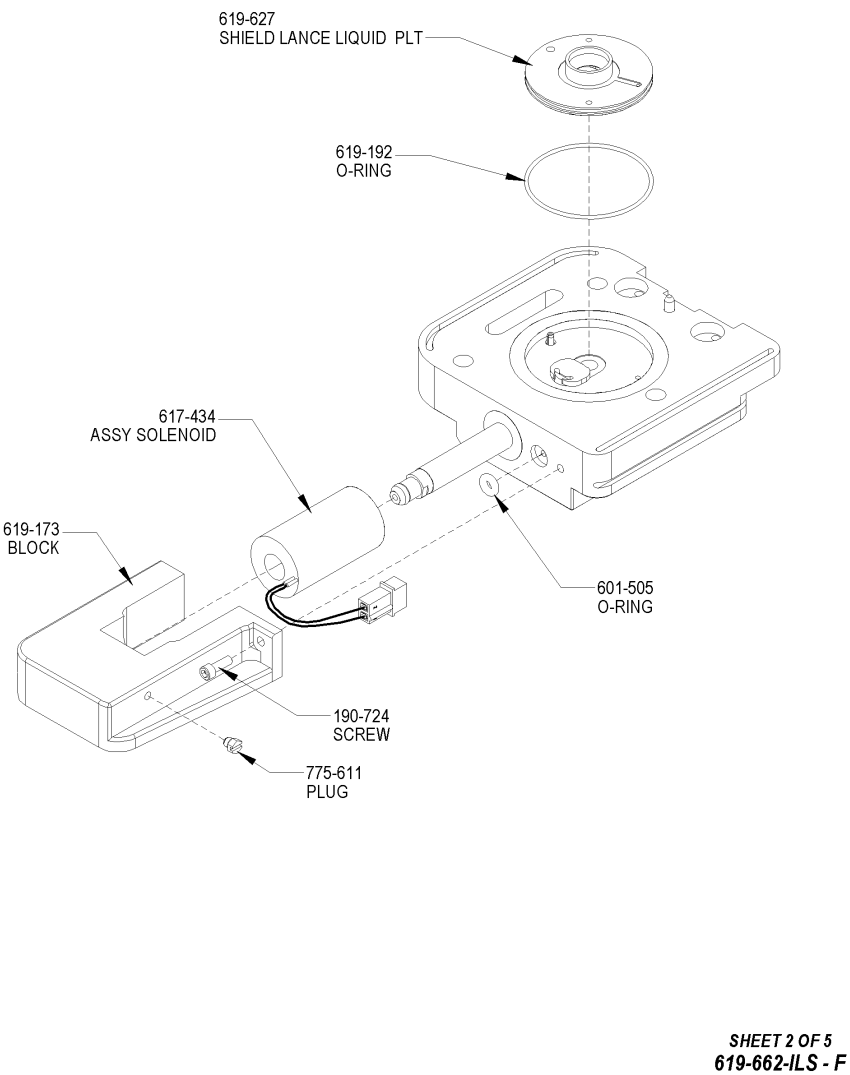


Figure 10-47
Liquid Loading Head Assembly 2 of 5

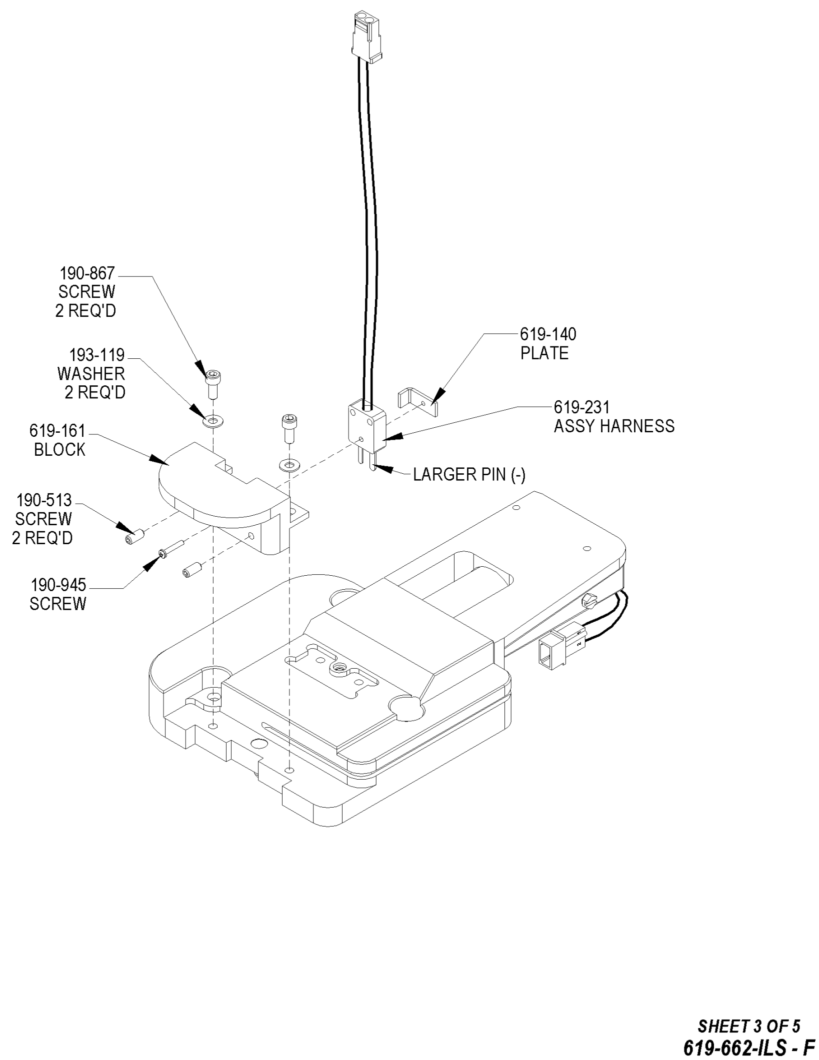


Figure 10-48
Liquid Loading Head Assembly 3 of 5

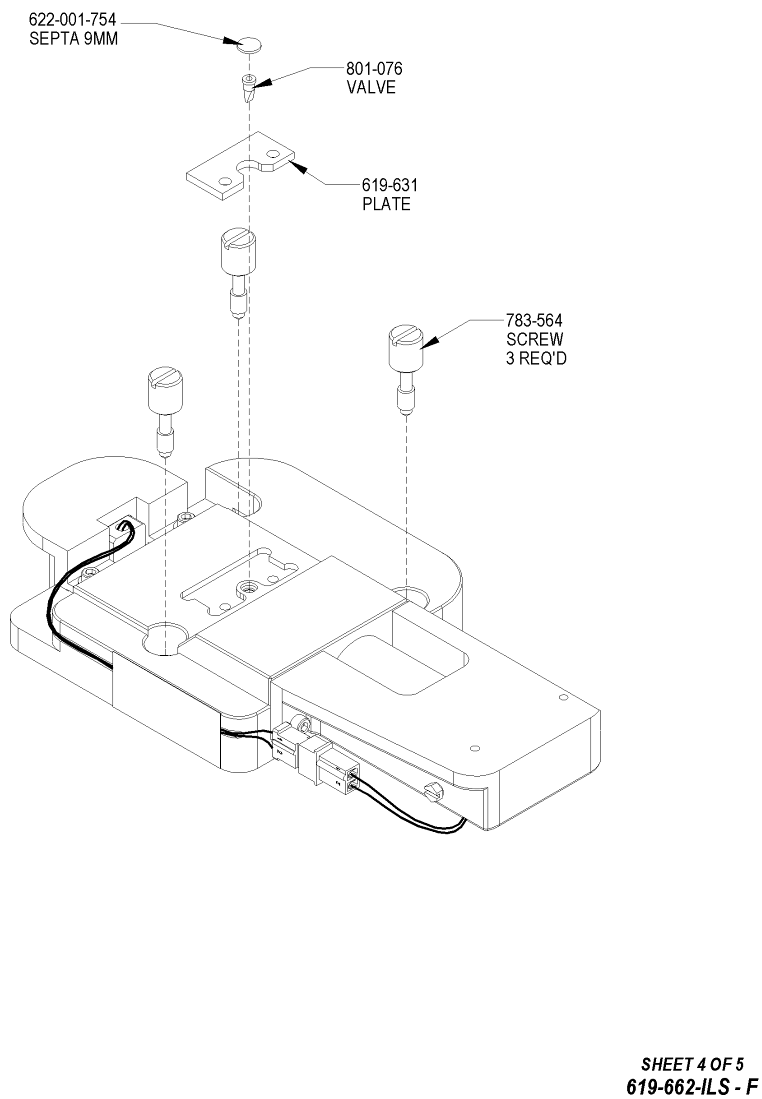


Figure 10-49
Liquid Loading Head Assembly 4 of 5

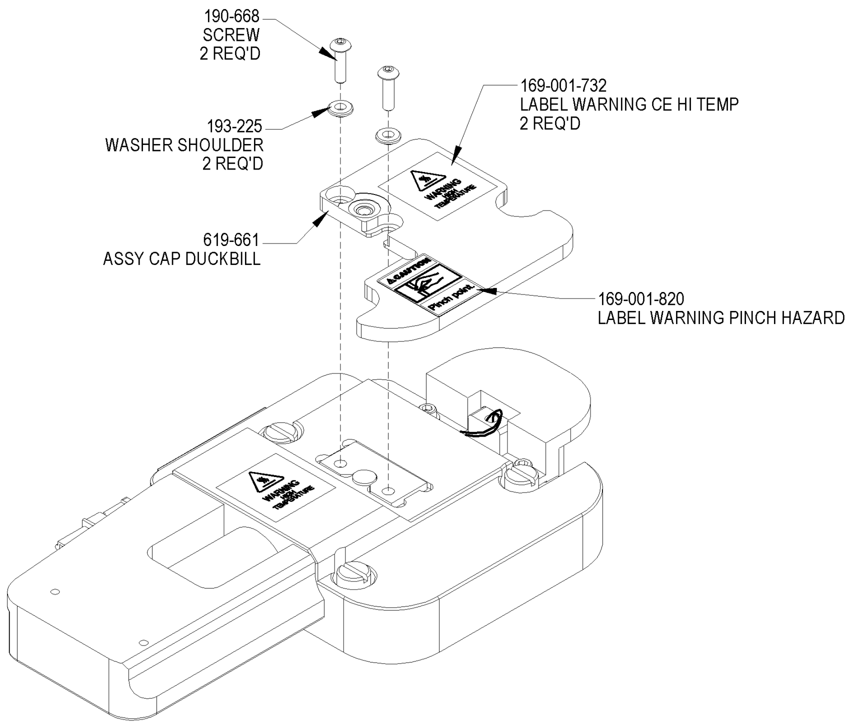


Figure 10-50
Liquid Loading Head Assembly 5 of 5

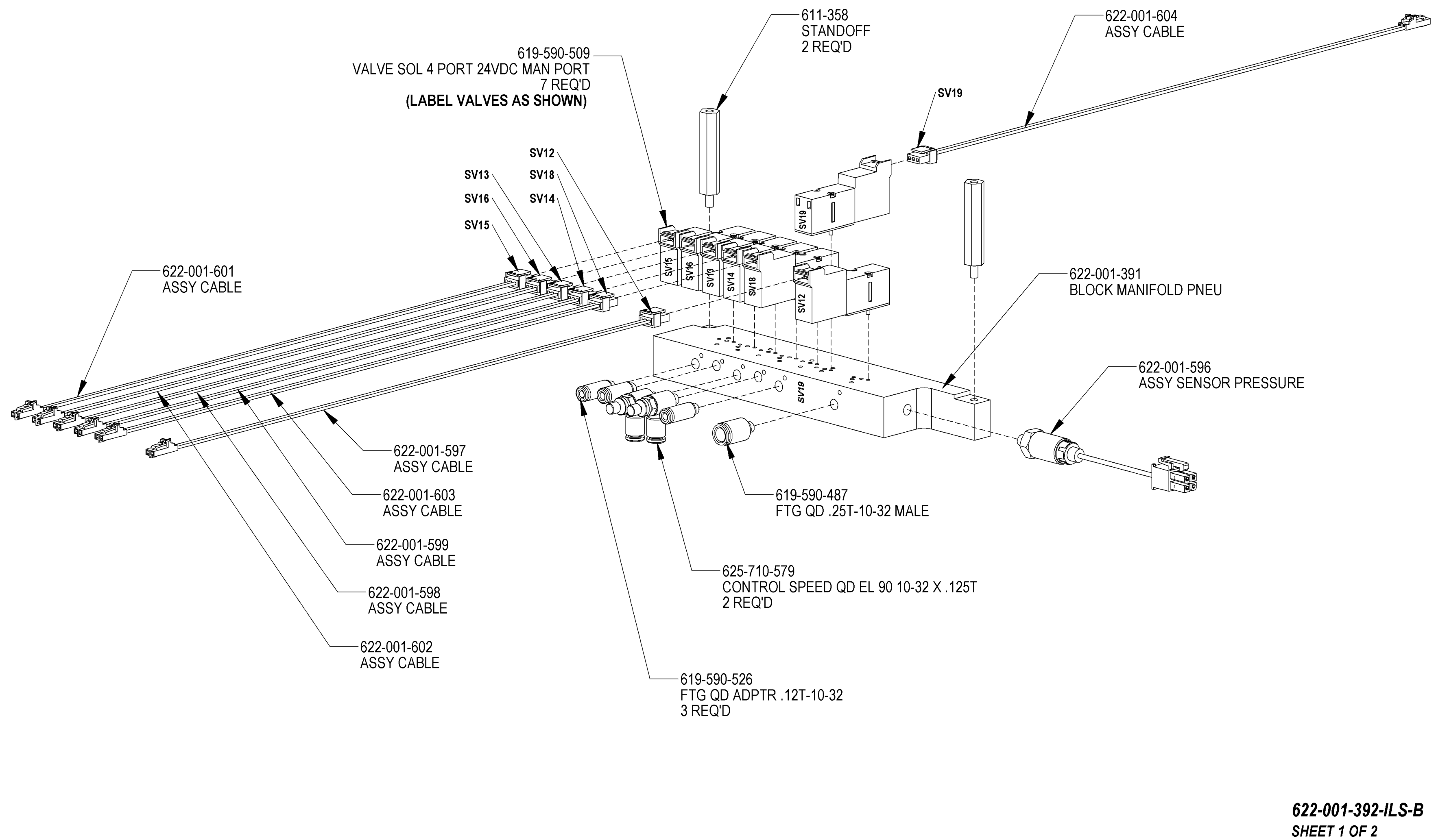


Figure 10-51
Manifold Pneumatic SMC Assembly 1 of 2

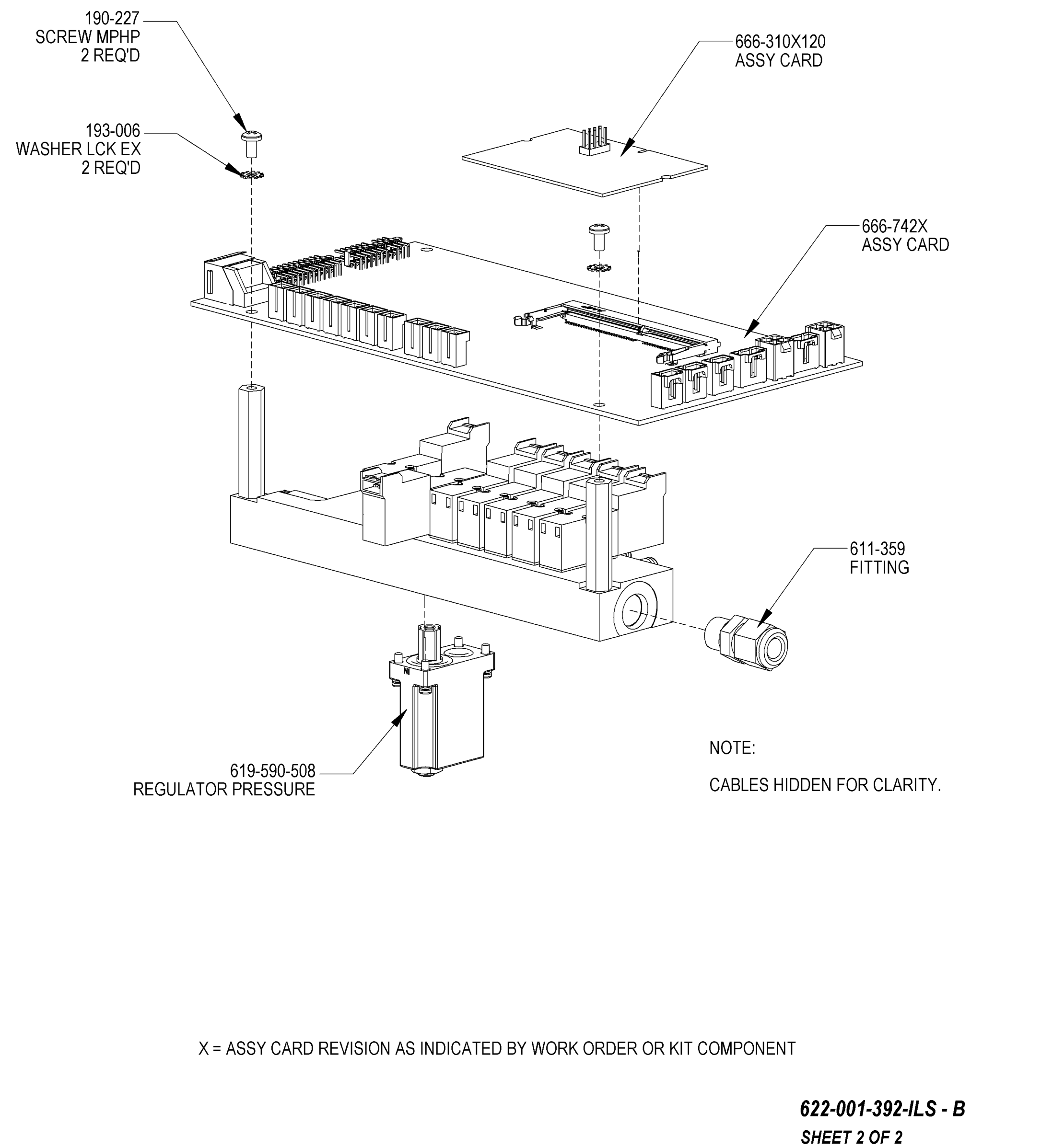


Figure 10-52
Manifold Pneumatic SMC Assembly 2 of 2

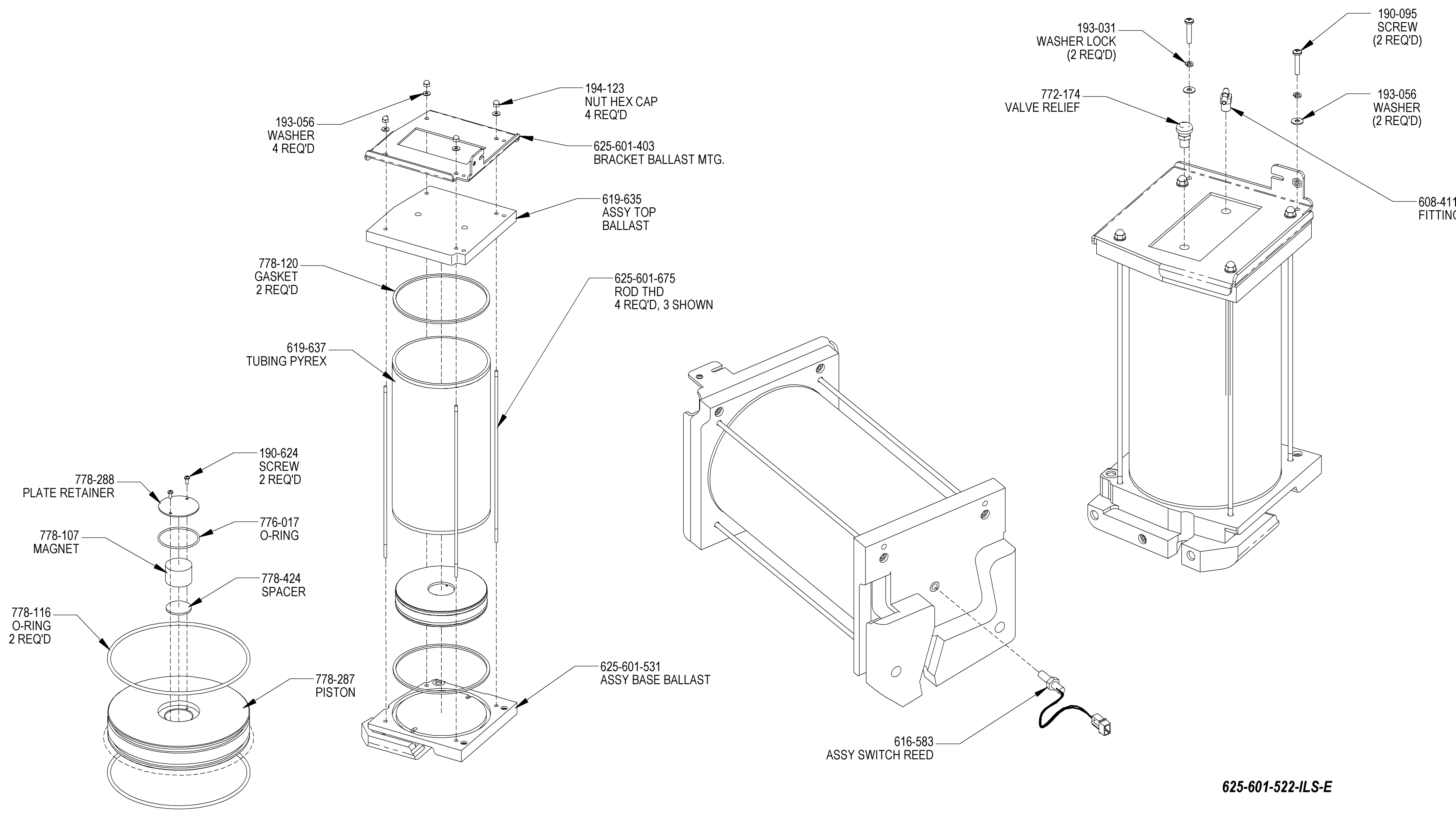


Figure 10-53
Ballast 4.5 L Assembly

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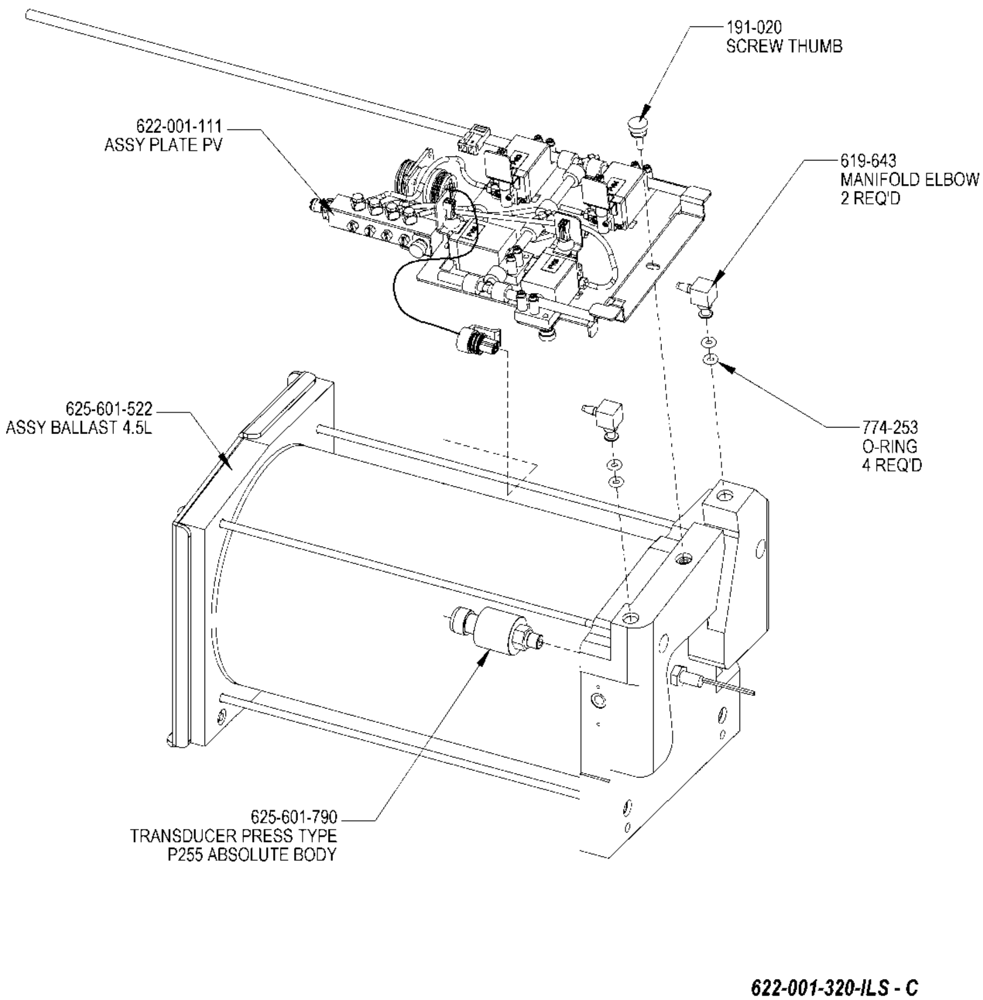


Figure 10-54
Ballast Plate Assembly

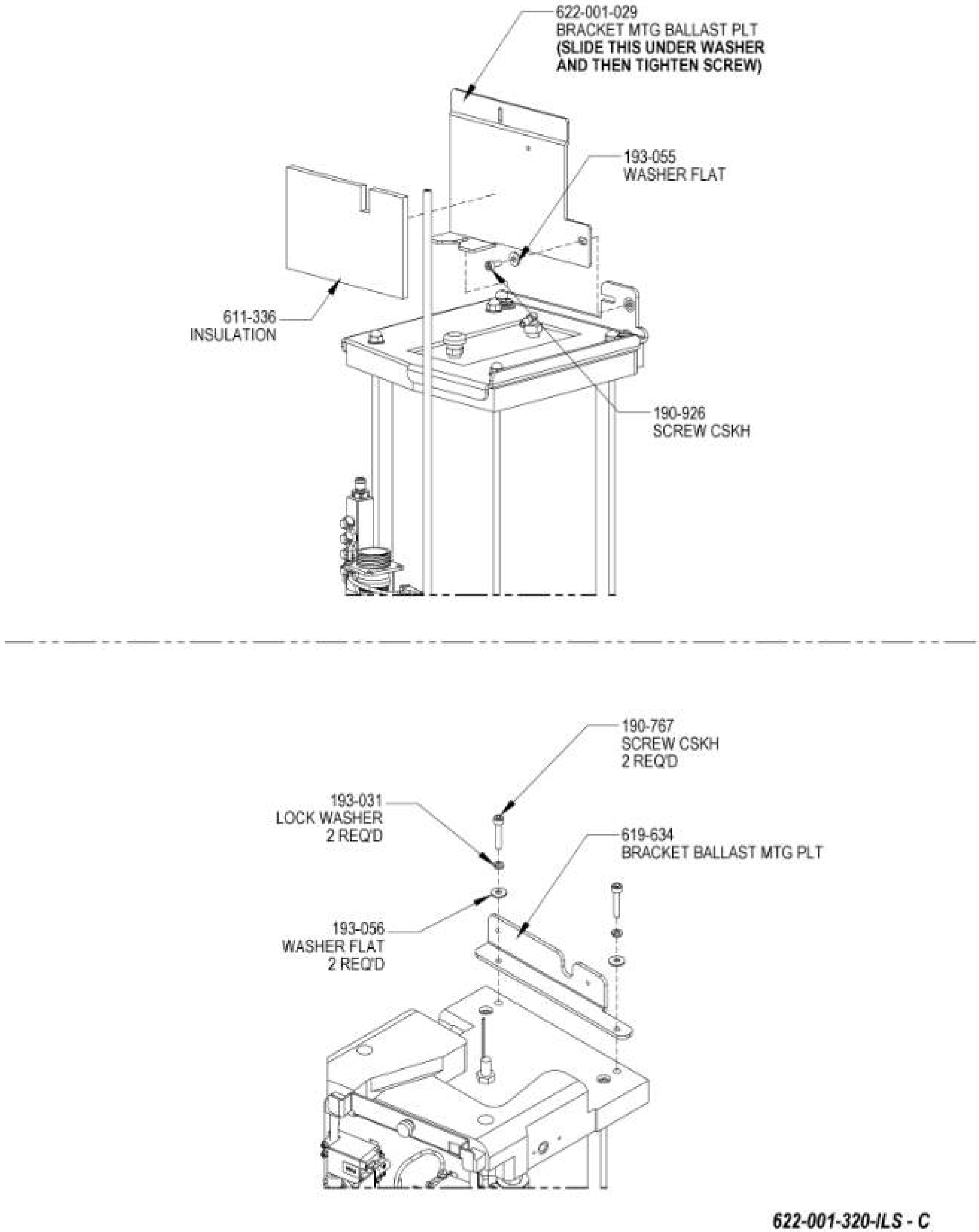


Figure 10-55
Ballast Top Bracket Assembly

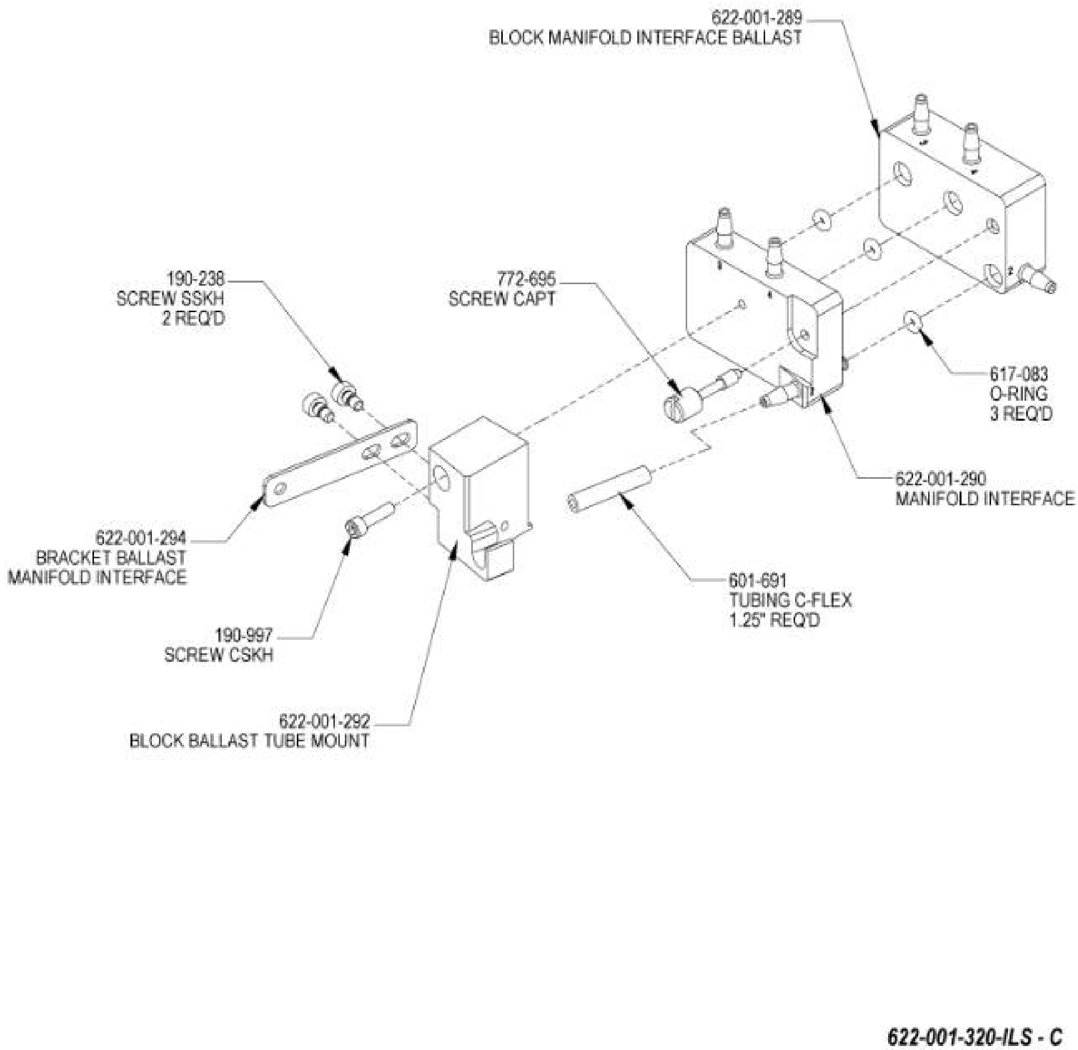


Figure 10-56
Ballast Interface Manifold Block Assembly

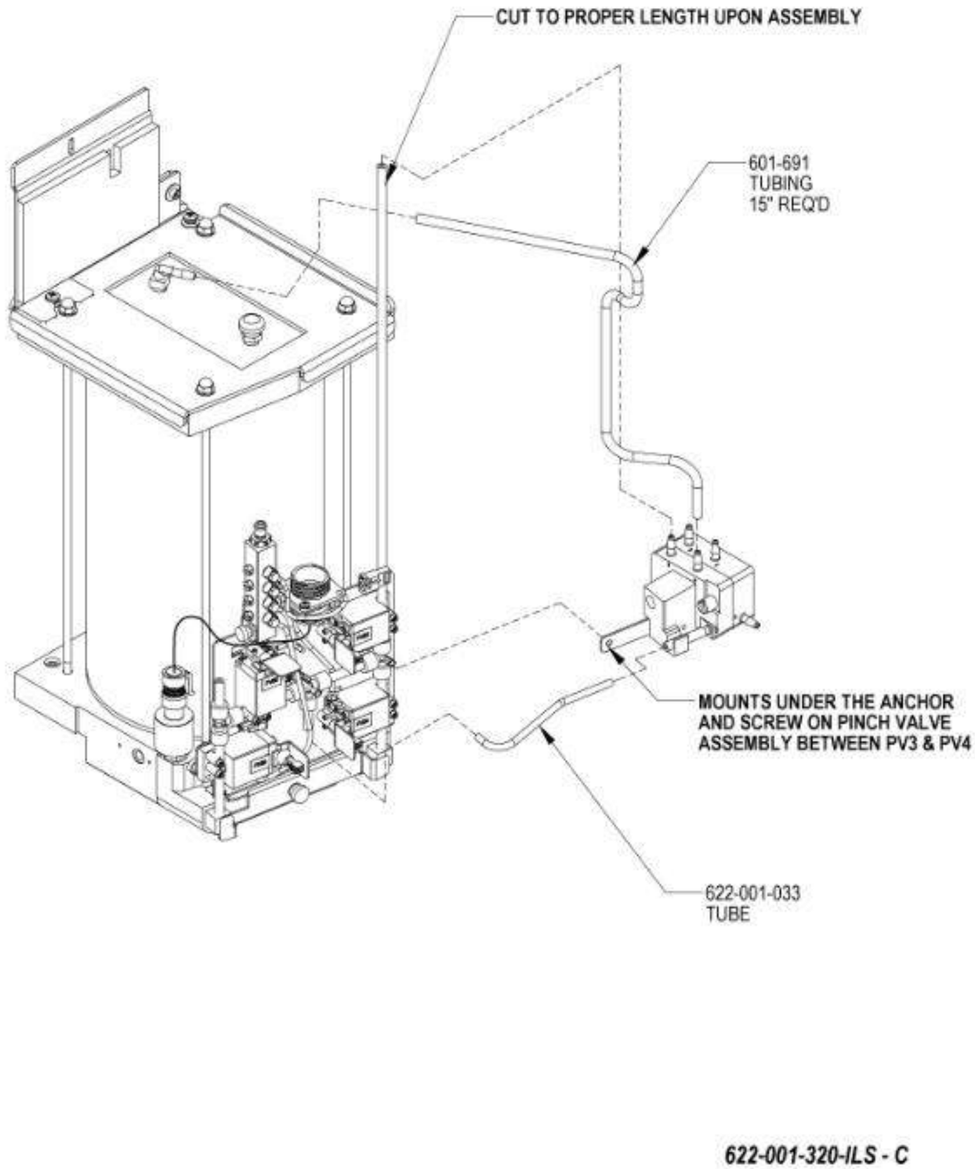


Figure 10-57
Connect Interface Manifold Block to Ballast

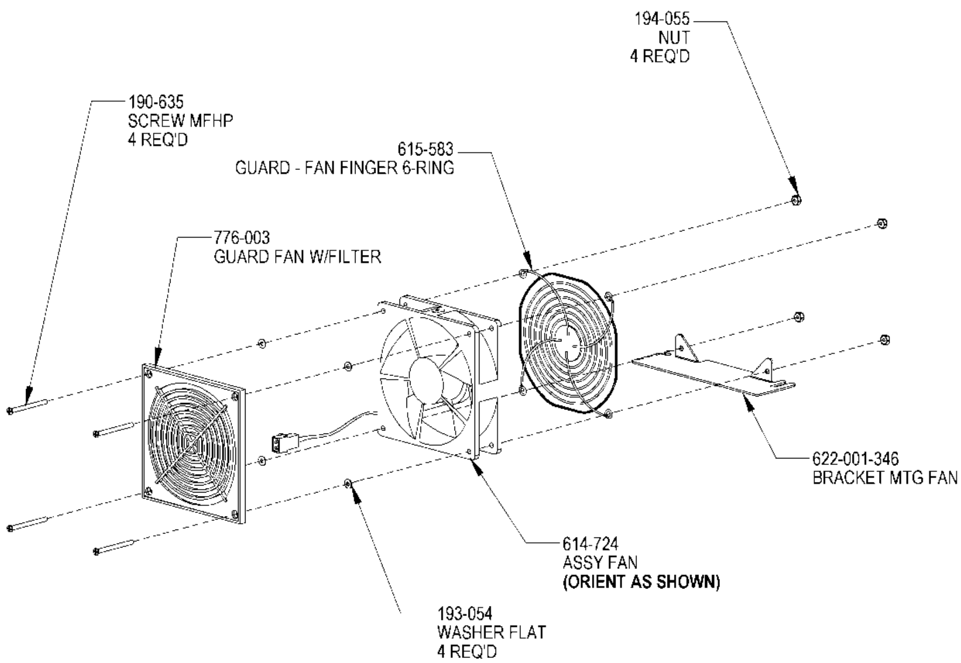


Figure 10-58
Fan Assembly

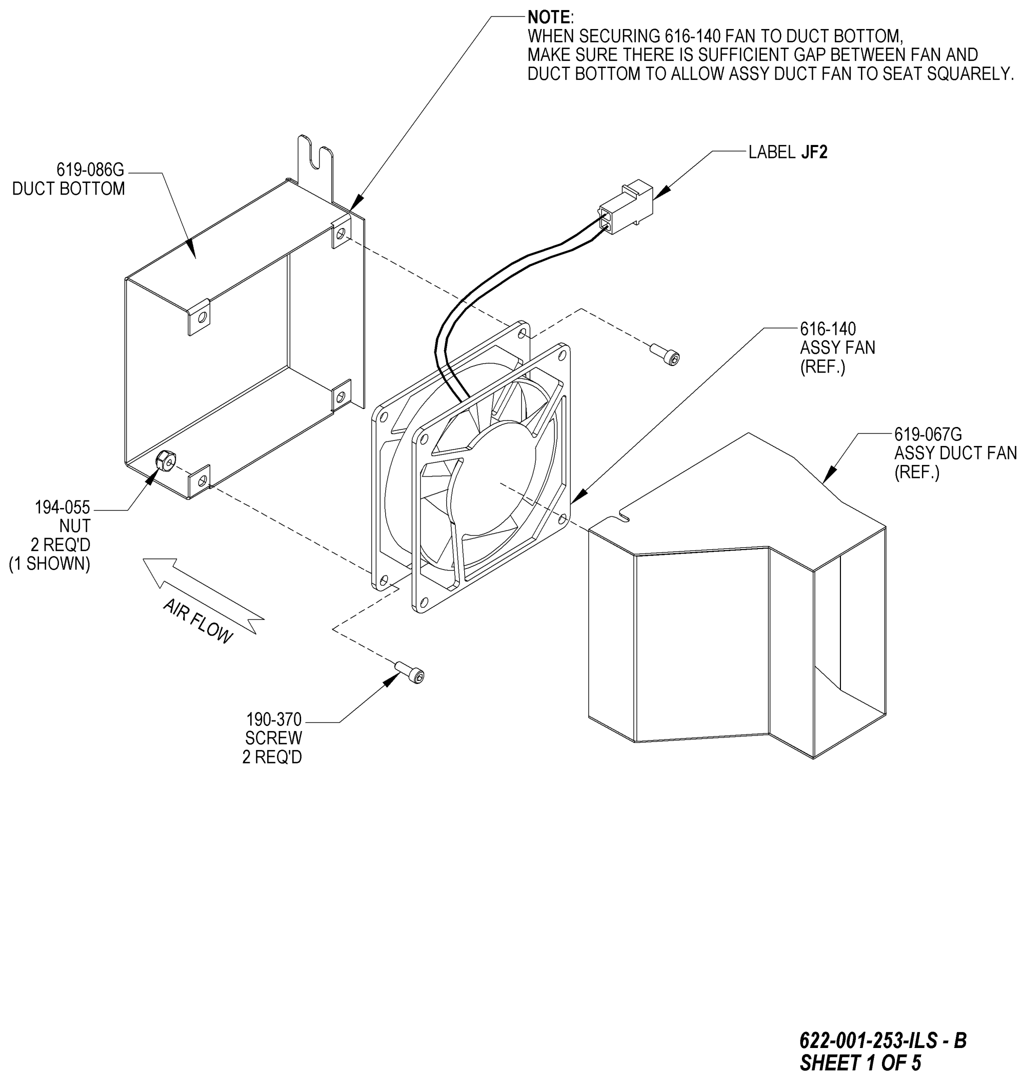


Figure 10-59
Thermoelectric Cooler Fan Assembly

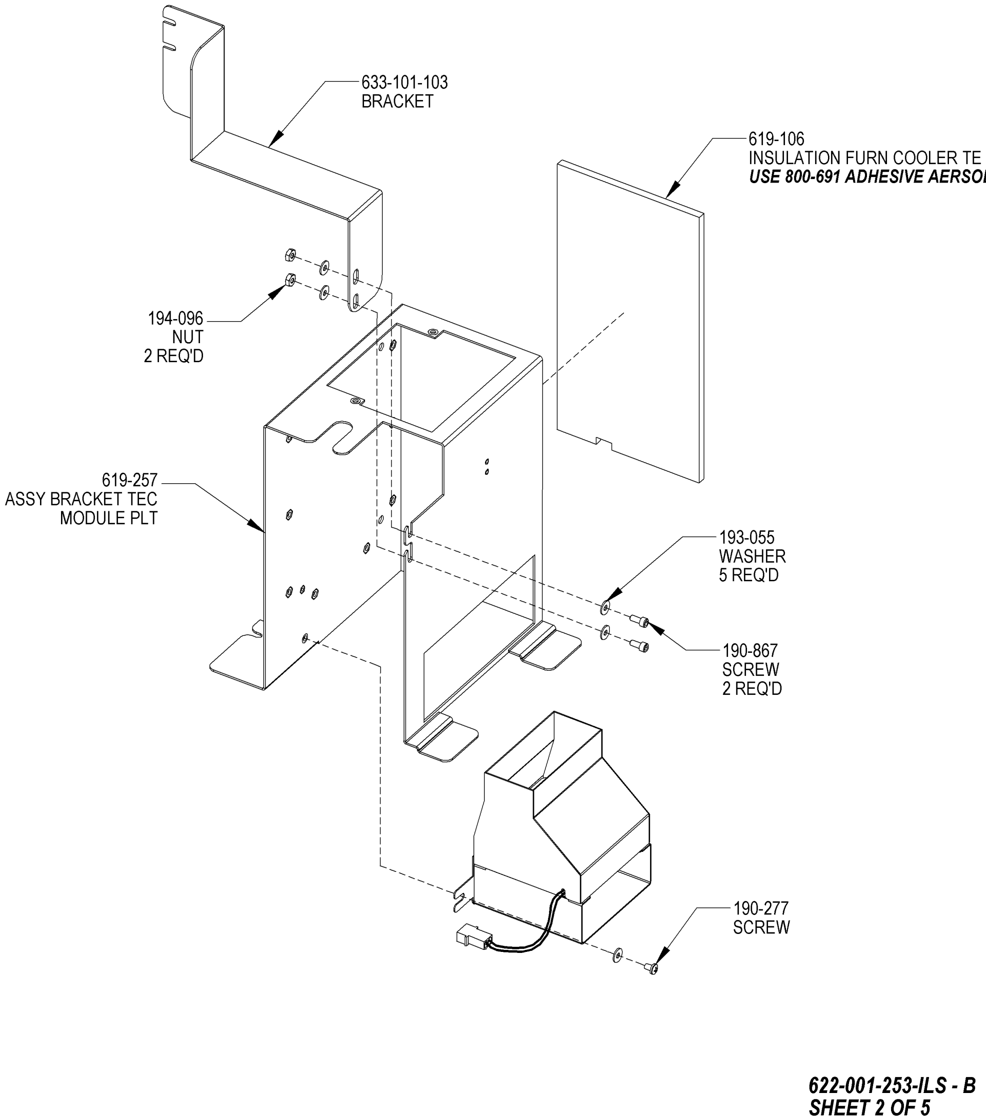


Figure 10-60
Thermoelectric Cooler Furnace Insulation Assembly

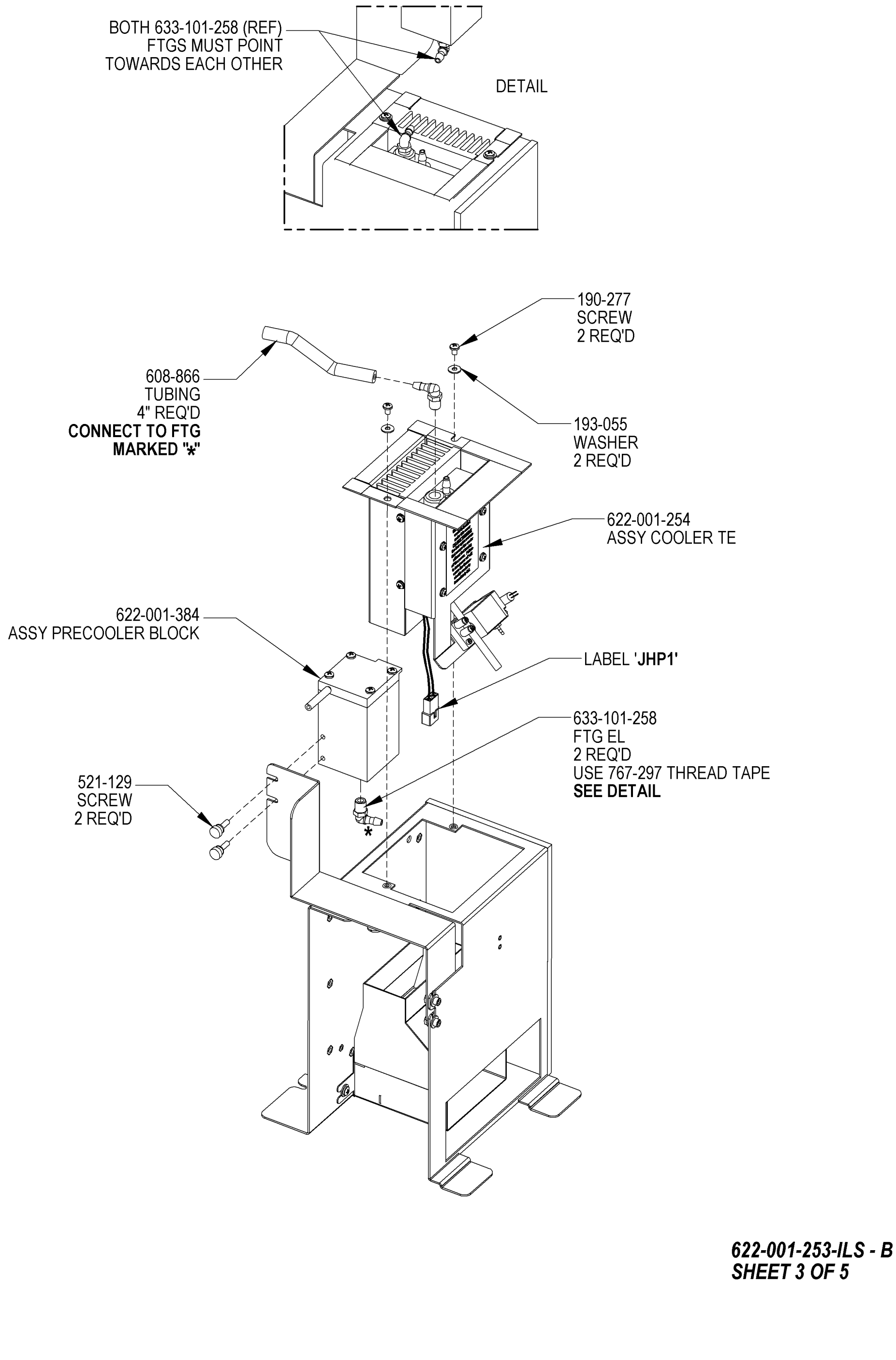
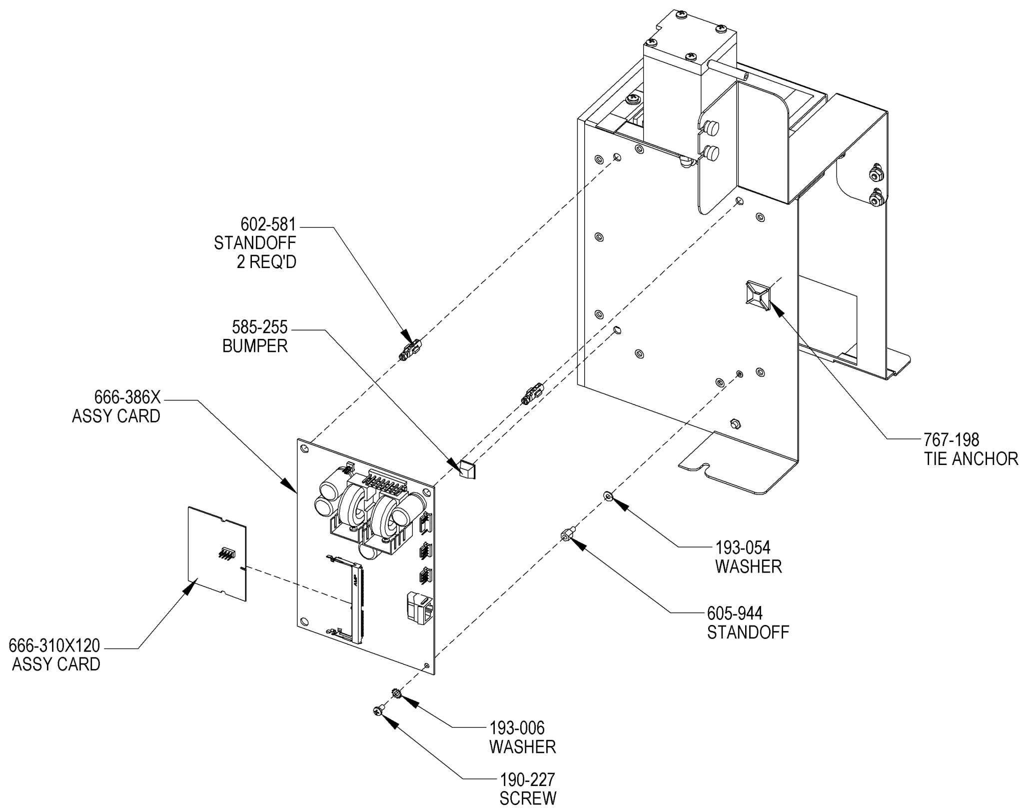


Figure 10-61
Thermoelectric Cooler Assembly

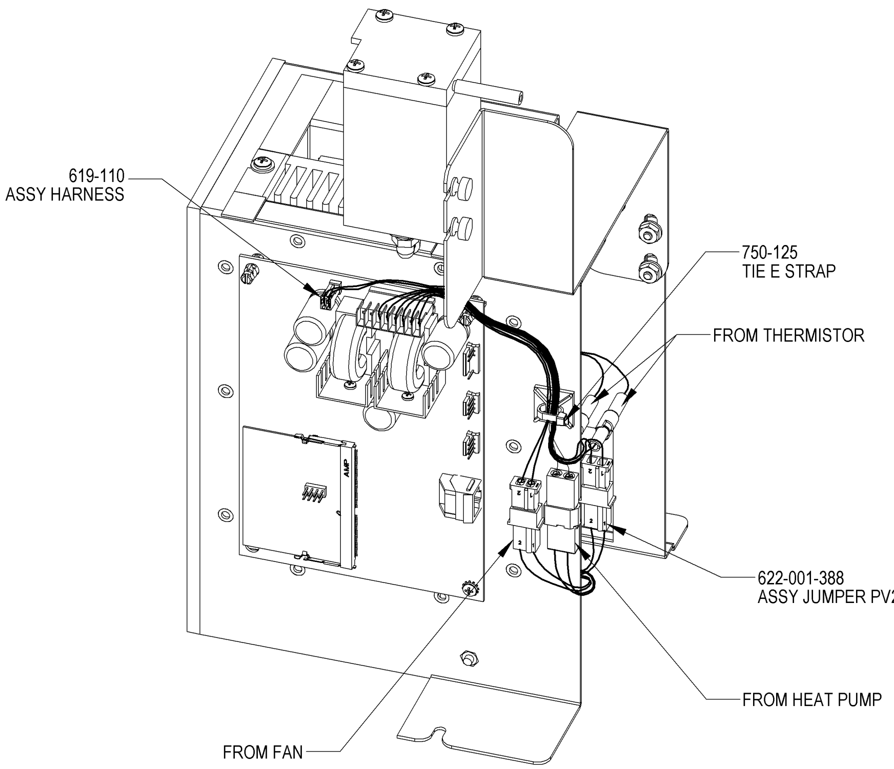


X = ASSY CARD REVISION AS INDICATED BY WORK ORDER OR KIT COMPONENT

622-001-253-ILS - B
SHEET 4 OF 5

Figure 10-62
Thermoelectric Cooler Card Assembly

FROM	TO
JF2	F2
JPV2	PV2
JHP1	HP1
JMT9	MT9



622-001-253-ILS - B
SHEET 5 OF 5

Figure 10-63
Thermoelectric Cooler Wiring Assembly

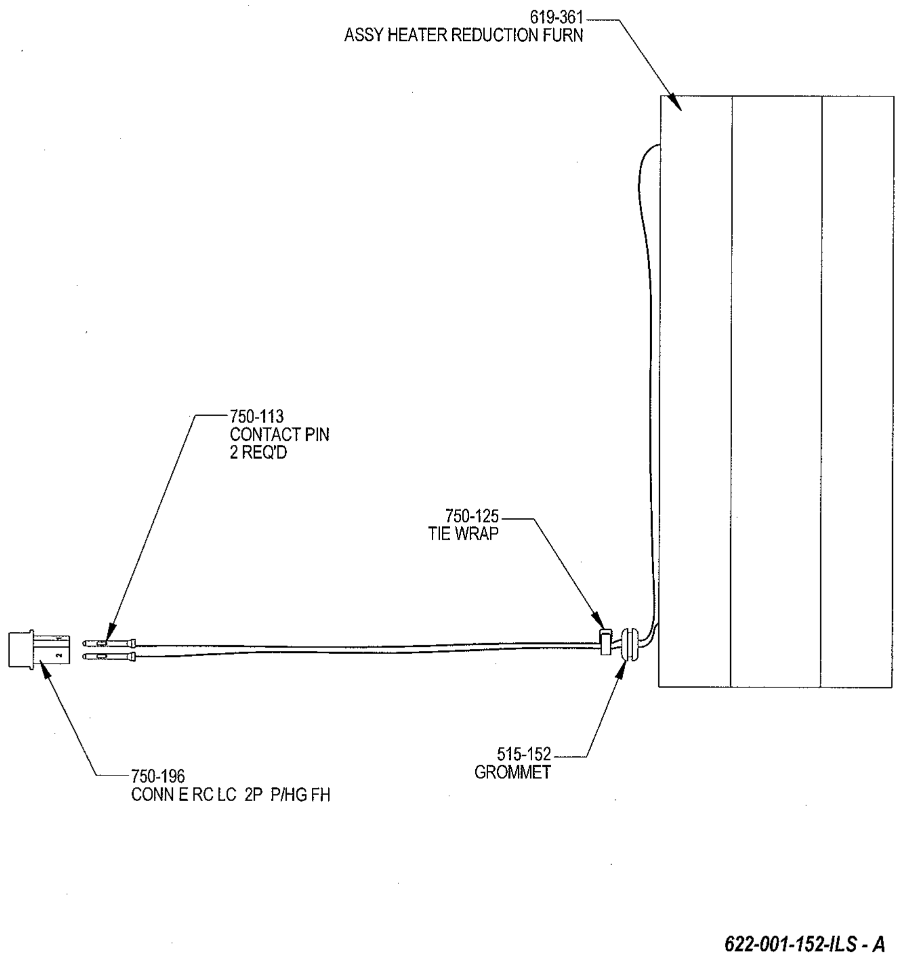


Figure 10-64
Furnace Reduction Heater Assembly

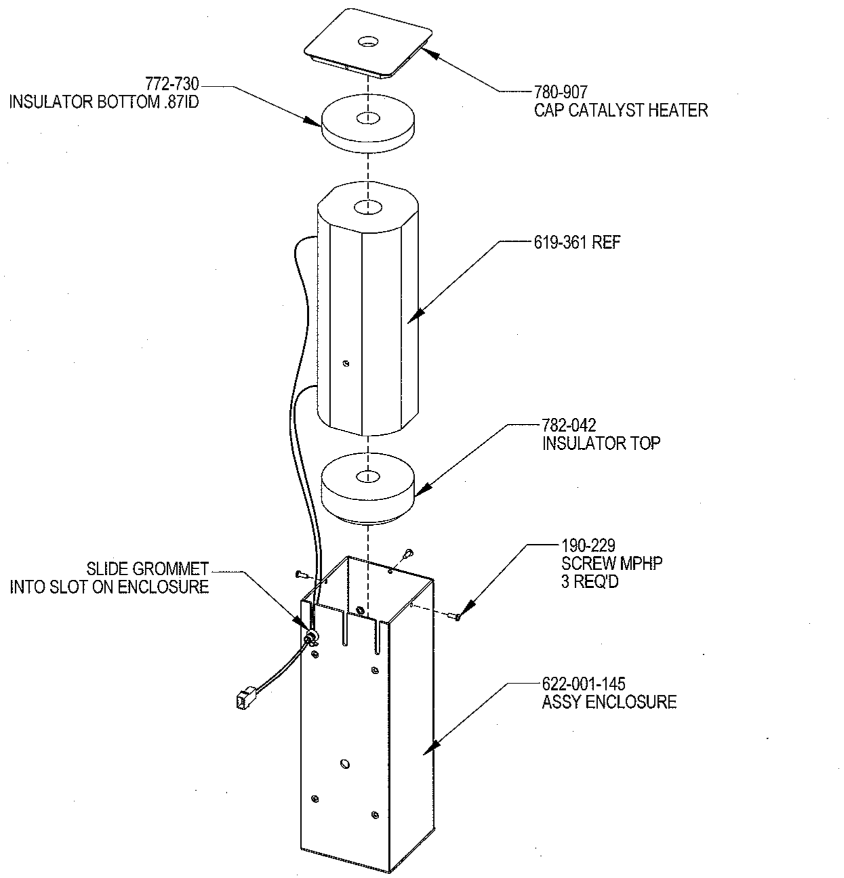


Figure 10-65
Catalyst Heater Assembly

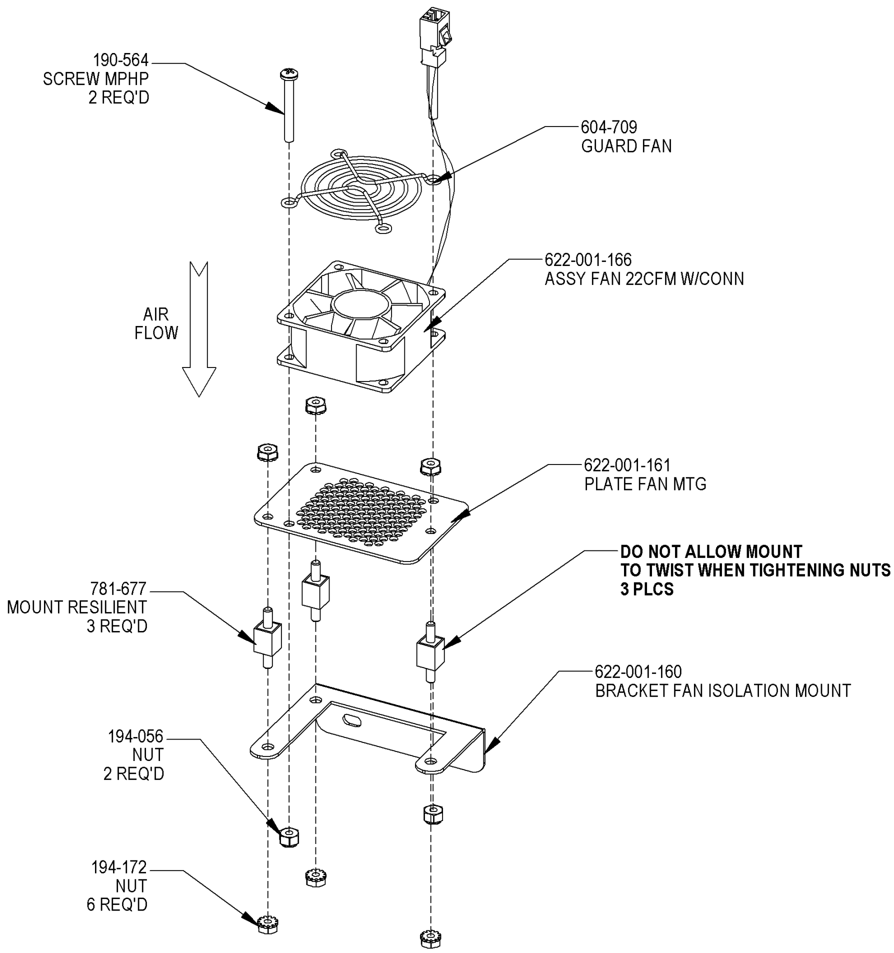


Figure 10-66
Bracket and Fan Assembly

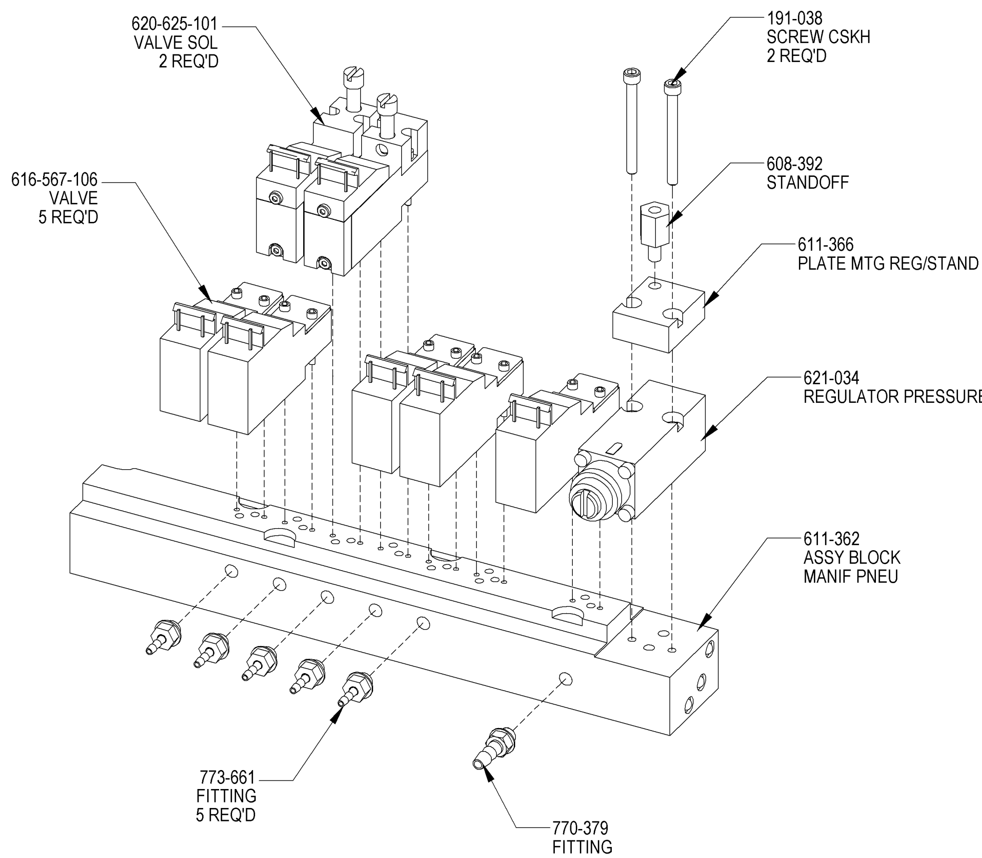


Figure 10-67
Pneumatic Manifold Assembly 1 of 3

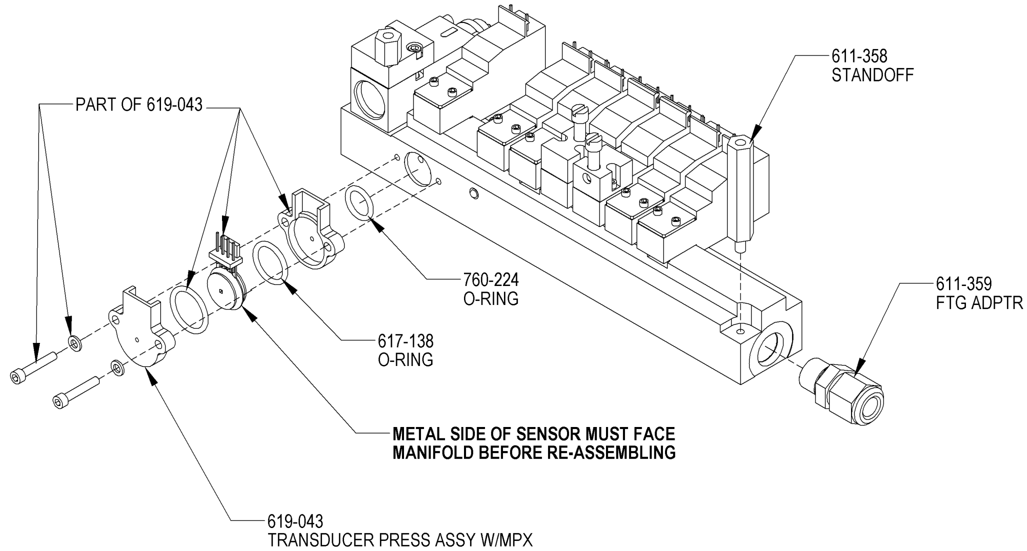
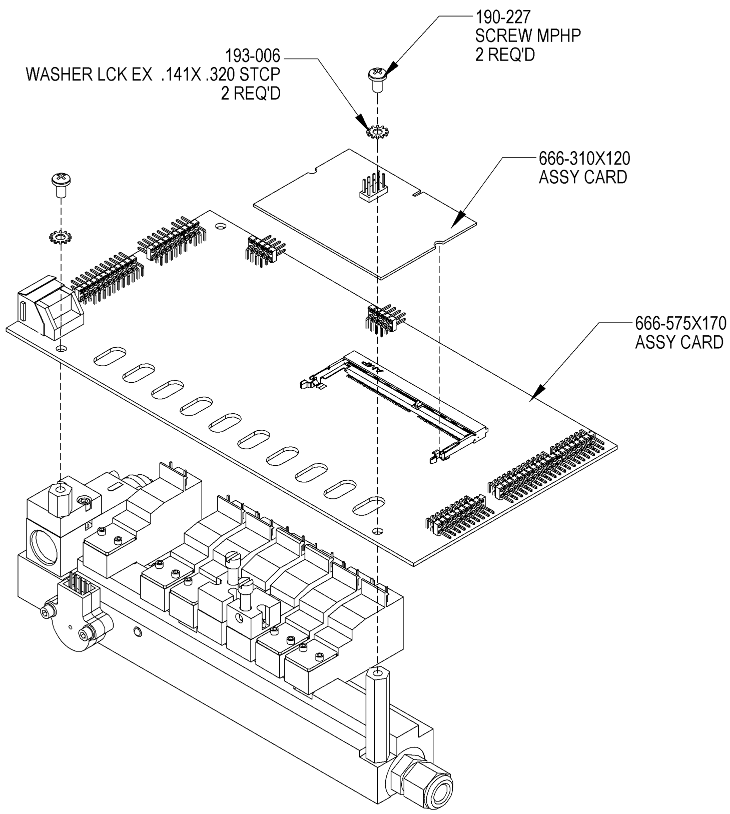


Figure 10-68
Pneumatic Manifold Assembly 2 of 3



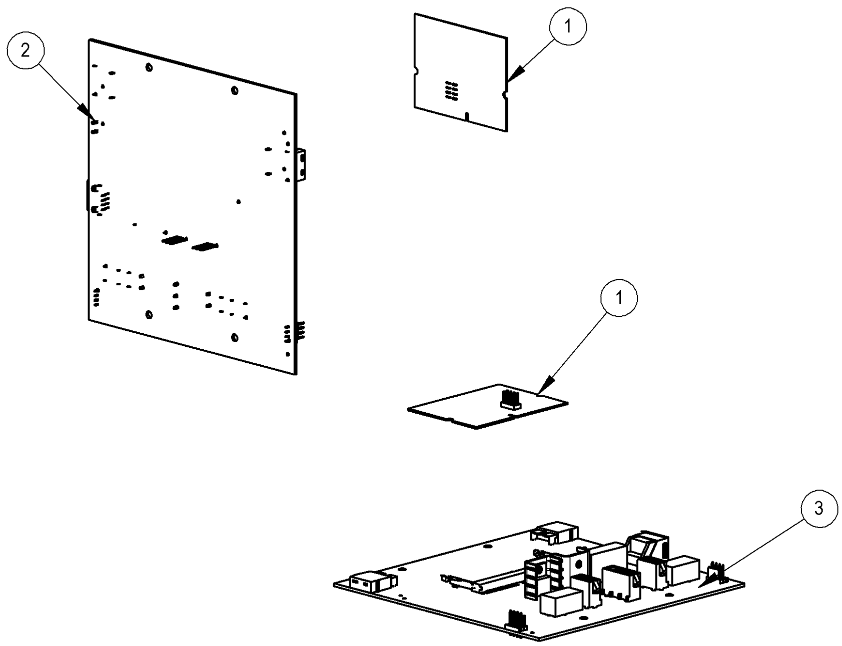
X = ASSY CARD REVISION AS INDICATED BY WORK ORDER OR KIT COMPONENT

622-001-434-ILS - A
SHEET 3 OF 3

Figure 10-69
Pneumatic Manifold Assembly 3 of 3

622-000-026-ILS PACK D-26 COMPONENT CHN628

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	666-310X120	ASSY CARD PGM NI SERVER SGL B	2
2	666-514X170	ASSY CARD SM ECL DUAL HTR V7	1
3	666-514X190	ASSY CARD SM ECL DUAL HTR V8 INST 1	1



622-000-026-ILS-B

Figure 10-70
D26 Cards Pack Component

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622-000-020-ILS ASSY CHN/CN/FP628 COMMON SUB

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	169-002-927	LABEL WARNING HAZARDOUS VOLTAGE	1
2	589-185	FTG UNION BR .25T - .25T	1
3	601-504	O-RING 147 2.675X 2.881X.103V	1
4	605-826	GUARD - FINGER FAN	2
5	615-525	PLUNGER SPRING LCK .375-16	1
6	615-958	Hinge Concealed Door Chrome	2
7	616-140	ASSY FAN AND CONNECTOR	2
8	616-147	ASSY TUBE LANCE U	1
9	618-149	GROMMET PLAIN	1
10	619-169	BRACKET ASSY FURNACE	1
11	622-001-117	CASTING SHROUD FRONT UPPER MACH	1
12	622-001-121	CASTING EDGING SHROUD FRONT FURN MACH	1
13	622-001-126	PLATE COVER TOP FURNACE	1
14	622-001-131	ASSY PLATE BAFFLE FURNACE	1
15	622-001-132	PAN FLOOR FURNACE	1
16	622-001-133	TUBE FURN FLOW CONN TO LOAD HEAD	1
17	622-001-140	ASSY PANEL TOP W/FAN	1
18	622-001-143	PANEL SIDE RIGHT P/PNT	1
19	622-001-146	BRACKET CATCH FURNACE	1
20	622-001-276	ASSY LOADING HEAD	1
21	622-001-382	FURNACE SHROUD BACK EDGING	1
22	622-001-383	BAR MOUNTING HINGE	1
23	622-001-555	ASSY FURNACE SHROUD BACK	1
24	703-041	CATCH MAGNET SNAP-IN LARGE	1
25	780-899	STOP CERAMIC HONEYC 1.12D X 1.50	1
26	801-491	LEVELER FOOT	1
27	806-772	GROMMET PLAIN	1

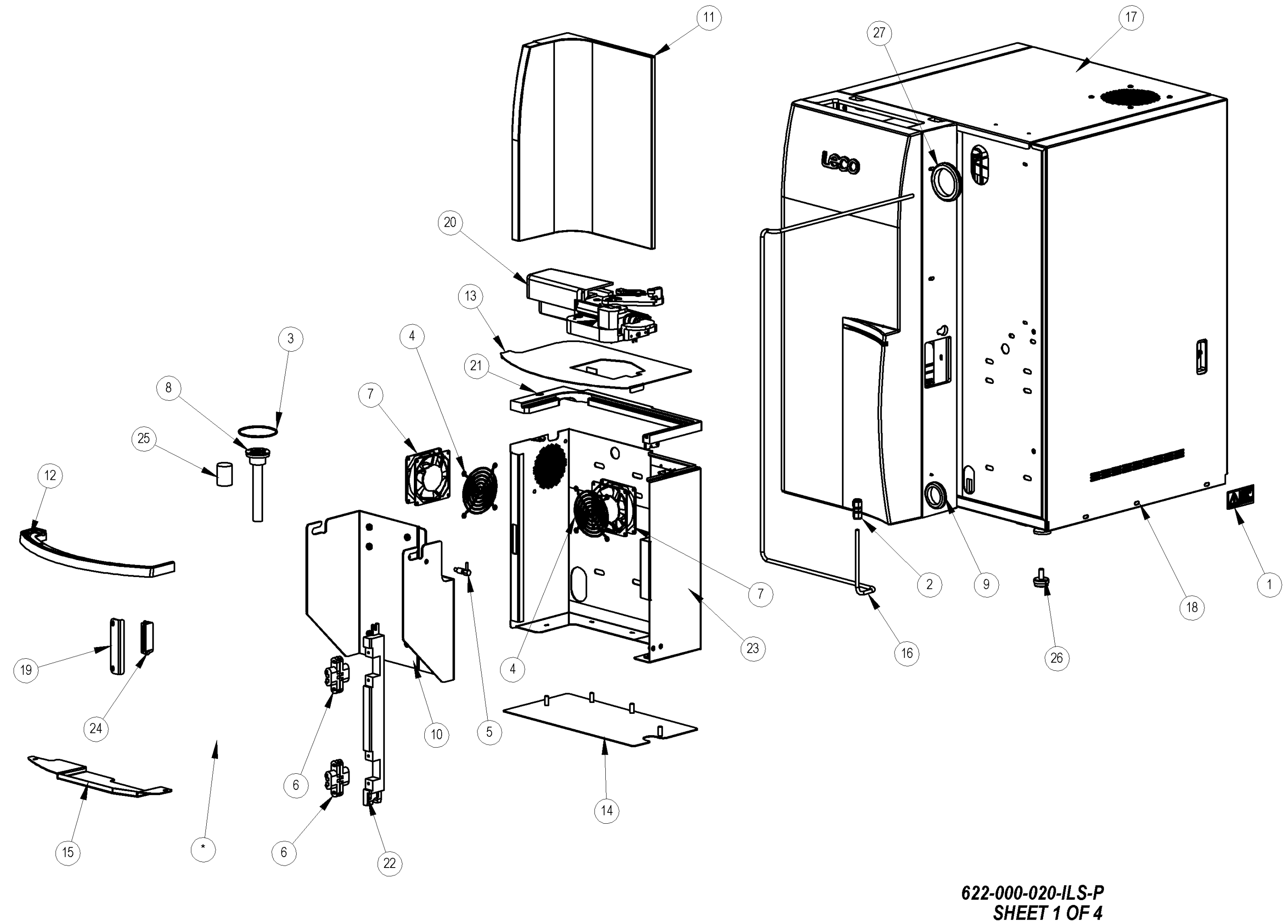


Figure 10-71
Common Subassembly 1 of 4

622-000-020-ILS ASSY CHN/CN/FP628 COMMON SUB

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	169-003-227	LABEL WARNING PRESSURIZED DEVICE	1
2	601-442	O-RING 113 .549X .755X.103V	1
3	604-377	SCREW CAPT .250-20 X 1.62 SST	1
4	605-795	STEM QUICK DISCONNECT TUBE	2
5	605-797	WASHER FLT W/SEAL	2
6	612-844	FTG ADPTR SS .12T-5/16-24 UNF	5
7	616-145	BLOCK REMOVABLE CAT HTR	1
8	617-083	O-RING 104 .112X .318X.103V	2
9	617-171	TUBE INTERCONNECT SST	1
10	617-713	CATCH ASSY DOOR NON-MAGNETIC	1
11	619-154	TUBE CATALYST HEATER	1
12	619-268	TUBE REAGENTS STRAIGHT	1
13	622-001-024	ASSY BLOCK REAGENTS UPPER PLT	1
14	622-001-025	BLOCK REAGENTS LOWER PLT	1
15	622-001-098	ASSY PANEL HEATER CATALYST	1
16	622-001-113	CASTING FRAME FRONT MACHINED P/P	1
17	622-001-142	ASSY PANEL SIDE LEFT W/INSUL	1
18	622-001-153	ASSY BRKT MTG CATCH FRAME	1
19	622-001-258	ASSY FILTER 0.60 MICRON	1
20	622-001-677	ASSY DOOR FRONT FURNACE	1
21	625-510-247	CLIP RETAINING TUBE REAGENT	1
22	625-601-967	SPACER BLOCK STATIONARY CAT HTR	1
23	625-601-968	BLOCK STATIONARY CAT HTR PLT	1
24	633-103-225	TUBE BOROS FILTER W/SLEEVE	1
25	765-976	O-RING 208 .609X .887X.139V	2
26	772-520	O-RING 108 .237X .443X.103V	5
27	775-306	FILTER SECONDARY 10MICRON	3

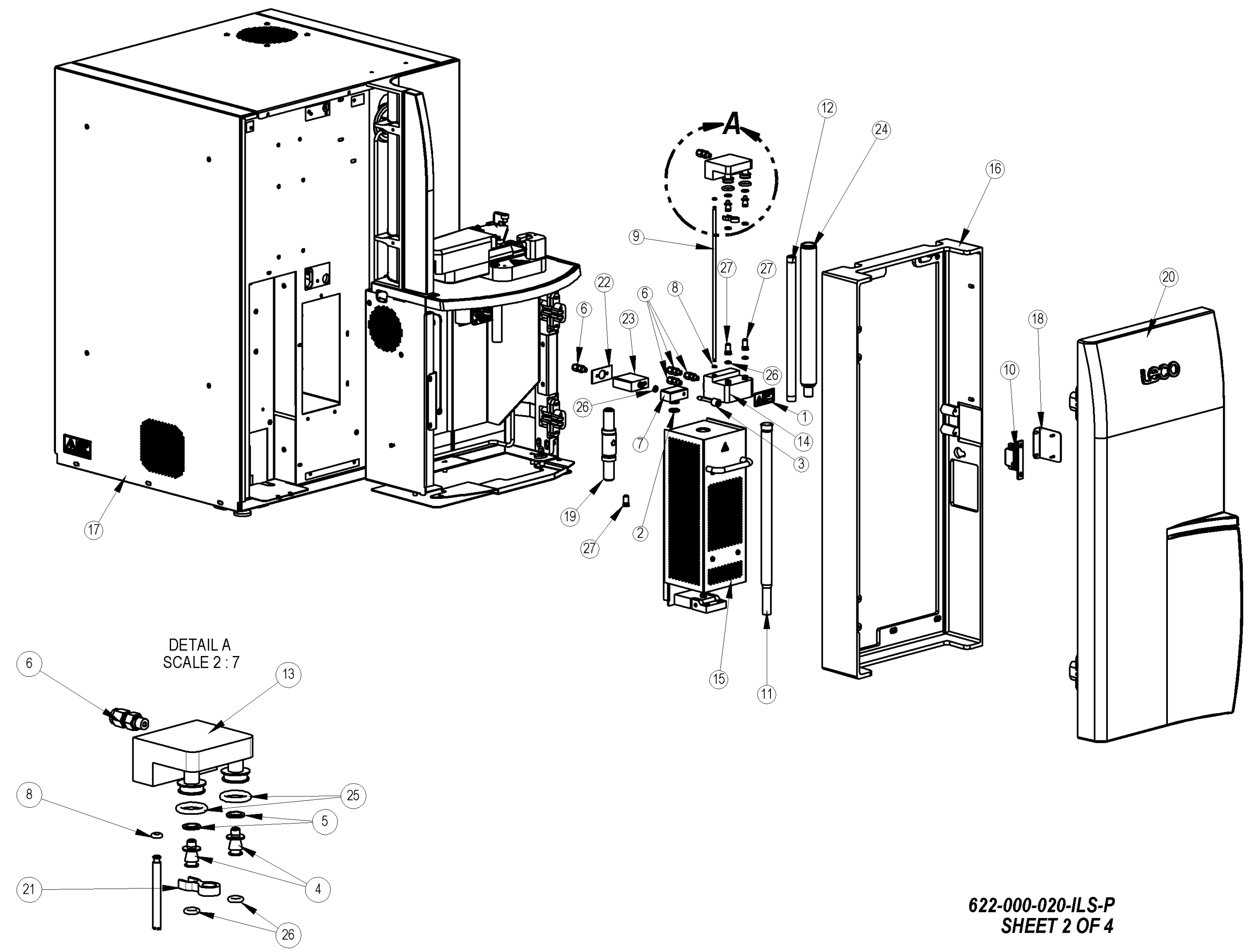
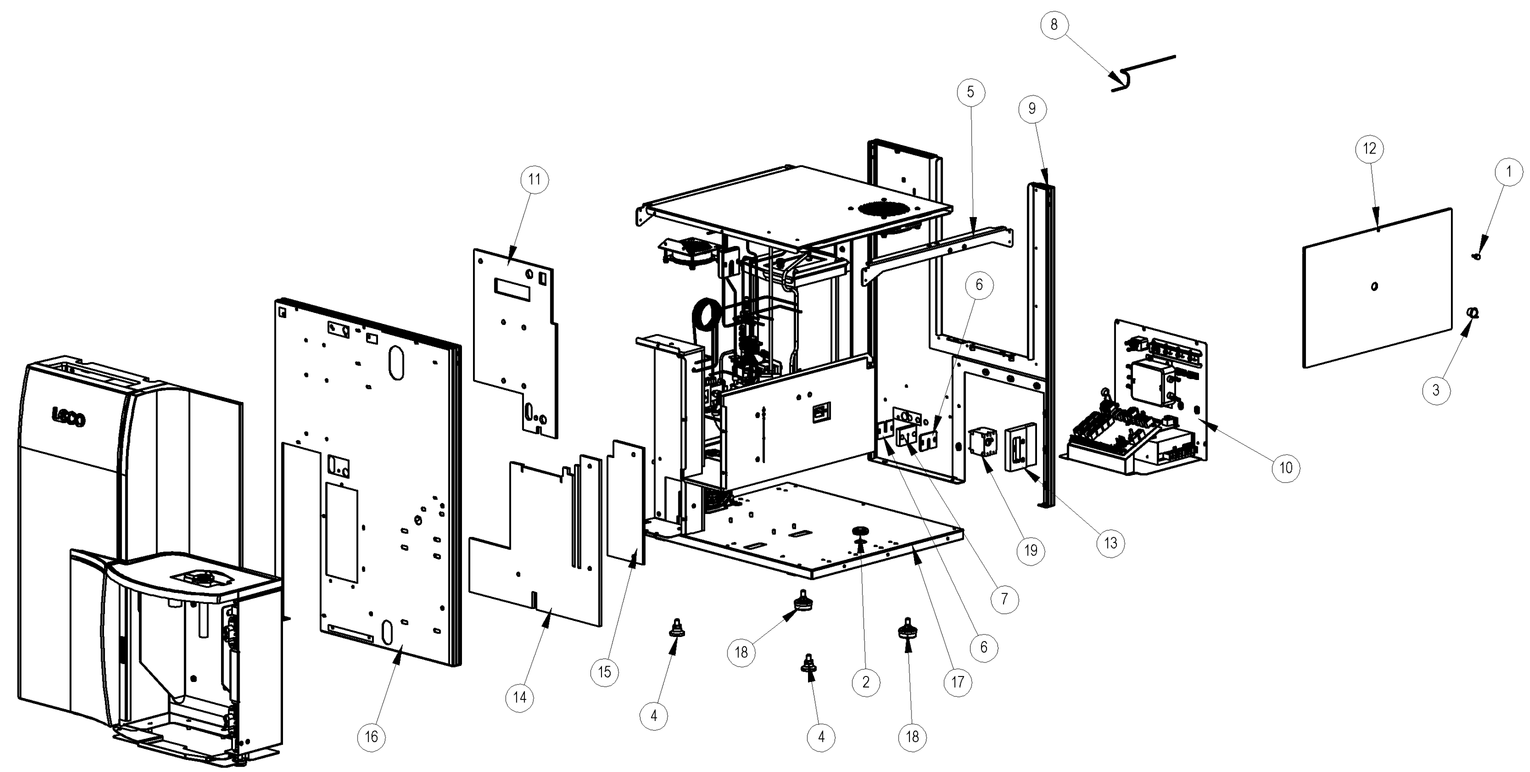


Figure 10-72
Common Subassembly 2 of 4

622-000-020-ILS ASSY CHN/CN/FP628 COMMON SUB

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	190-009	SCREW THUMB 8-32 X .38 BR NP	1
2	512-812	GROMMET PLAIN	1
3	516-011	CAP PRTV C .610/.695 PLE L/T	1
4	606-259	ASSY PAD LEVELING SLIDE	2
5	621-430	Support Corner Frame TC	1
6	622-001-072	COVER CABLE BALLAST OVEN LOWER	2
7	622-001-073	INSULATION CAP BALLAST OVEN LOWER	1
8	622-001-083	TUBE CG FILTER TO MANIFOLD FEEDTHRU	1
9	622-001-136	ASSY PANEL BACK P/PNT	1
10	622-001-151	ASSY POWER SUPPLY DISTR AC	1
11	622-001-219	INSULATION FRONT OVEN SEC	1
12	622-001-314	ASSY COVER FRONT DOOR	1
13	622-001-324	BOX SHADOW CB 12 AMP	1
14	622-001-326	INSULATION FRONT ANGLE COVER	1
15	622-001-327	INSULATION SIDE REAGENT LOWER	1
16	622-001-737	ASSY PANEL INNER FRONT PLT/PNT	1
17	660-010-146	ASSY BASE	1
18	780-970	FOOT LEVELING .375-16X .625	2
19	789-320	CIRCUIT BRK 15 A 250V DPST PO	1

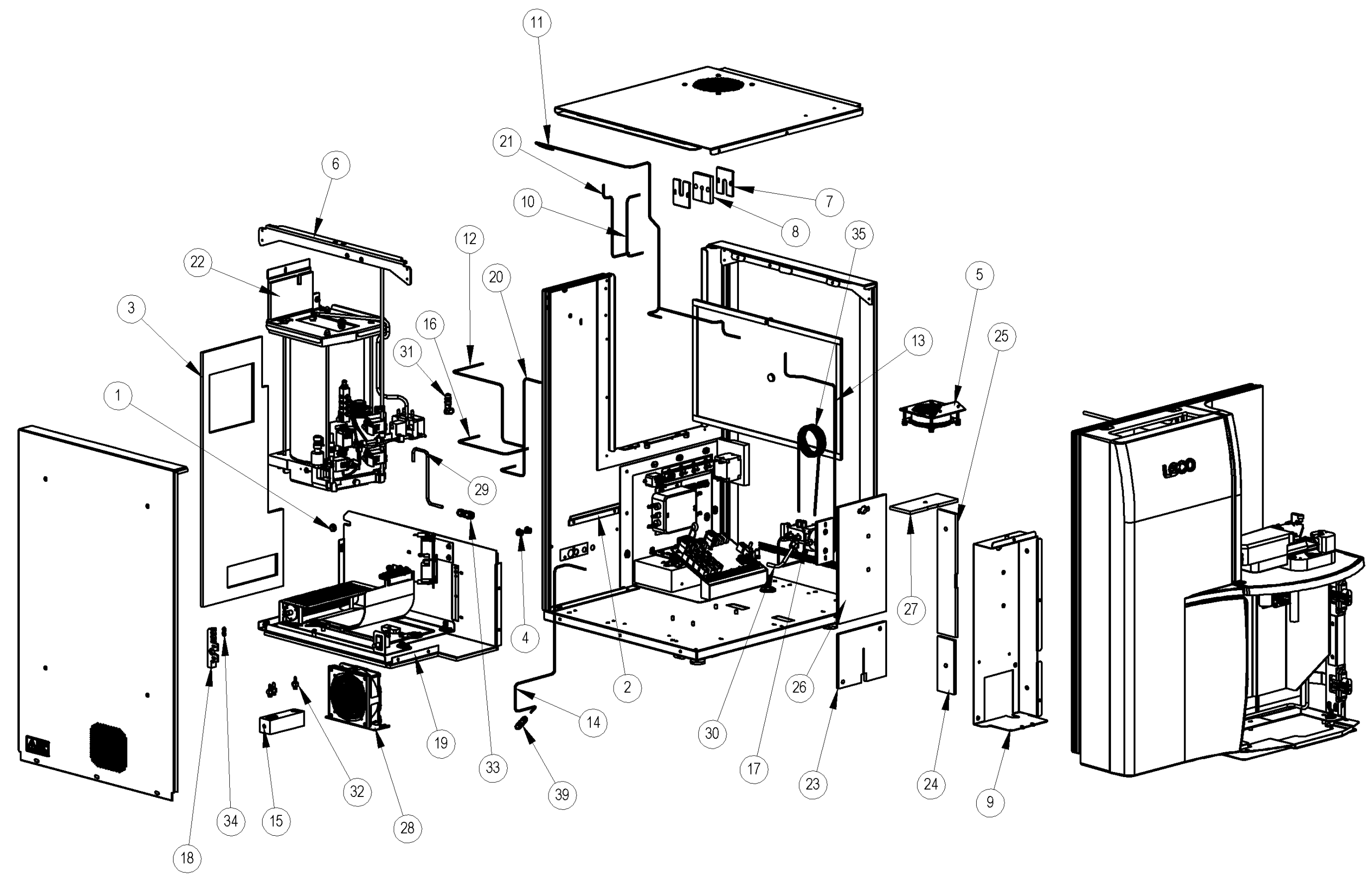


622-000-020-ILS-P
SHEET 3 OF 4

Figure 10-73
Common Subassembly 3 of 4

622-000-020-ILS ASSY CHN/CN/FP628 COMMON SUB

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	515-150	Grommet Plain	1
2	609-040	BRACKET BALLAST MTG	1
3	611-337	INSULATION BACK OVEN SEC	1
4	614-934	PLUG BUTTON .437 DIA BLK PL	2
5	619-705	ASSY FAN BALLAST W/BKT	1
6	621-430	Support Corner Frame TC	1
7	622-001-067	COVER CABLE BALLAST OVEN UPPER	2
8	622-001-068	INSULATION CAP BALLAST OVEN UPPER	1
9	622-001-078	ASSY WALL LOWER OVEN SEC P/PNT	1
10	622-001-084	TUBE MANIFOLD FEEDTHRU TO TC CELL INTERFACE MANIFOLD PORT 4	1
11	622-001-087	TUBE REAGENT TUBE LOWER-BACK TO CG MANIFOLD INPUT	1
12	622-001-088	TUBE REAGENT TUBE LOWER-FRONT BOTTOM TO CG FLOW CONTROL IN (T0P)	1
13	622-001-089	TUBE CG MANIFOLD MEASURE PRESSURE OUT TO DOSER PORT G	1
14	622-001-094	TUBE REA HTR BOT MAN TO REA LWR MAN TOP	1
15	622-001-135	ASSY MANIFOLD EXHAUST	1
16	622-001-228	TUBE TC#6 MAN TO FC BOT	1
17	622-001-236	ASSY VALVE DOSING 8-PORT W/BRACKET	1
18	622-001-312	BLOCK TUBE HOLDER	1
19	622-001-315	ASSY SHELF W/HEATER	1
20	622-001-316	TUBE MANIFOLD PORT 4 TO REAGENT TUBE UPPER	1
21	622-001-317	TUBE MANIFOLD PORT 1 TO CG MANIFOLD INPUT	1
22	622-001-320	ASSY BALLAST WITH PINCH VALVES	1
23	622-001-328	INSULATION FRONT REAGENT UPPER	1
24	622-001-329	INSULATION SIDE REAGENT UPPER	1
25	622-001-333	INSULATION SIDE REAGENT UPPER	1
26	622-001-334	INSULATION FRONT REAGENT UPPER	1
27	622-001-335	INSULATION TOP REAGENT UPPER	1
28	622-001-345	ASSY FAN MOUNTED	1
29	622-001-365	TUBE BALLAST PV5-PV6 TO UNION	1
30	622-001-366	TUBE UNION TO DOSER PORT E	1
31	625-601-524	FTG QD CPLG DL .25T- .12NPT W/SHUT OFF	1
32	625-601-988	FTG PEEK 5/16-24 - .15HB	3
33	625-602-105	FTG UNION SS RED .250-.187	1
34	774-253	O-RING 106 .174X .380X.103V	2
35	778-233	LOOP SAMPLING 10CC SST	1
36	782-236	FTG UNION SS .12T - .12T	1



622-000-020-ILS-P
SHEET 4 OF 4

Figure 10-74
Common Subassembly 4 of 4

622-020-071-ILS PACK COMPONENT FP628

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	604-312	CLIP FLASK	2
2	609-110	ASSY FLASK EXHAUST	1
3	619-154	TUBE CATALYST HEATER	1
4	619-180	ASSY CAROUSEL STACKABLE 30 POS	1
5	619-268	TUBE REAGENTS STRAIGHT	1
6	619-304	ASSY COVER DUST CAROUSEL	1
7	619-377	ASSY PLATE BYPASS	1
8	619-592-394	ASSY CONNECTION FLX .25 PNEUMATIC 12 FT	1
9	619-592-395	ASSY CONNECTION CU .125 GAS CARRIER 6 FT	1
10	620-677	CABLE ASSY CAT 5 SHIELDED RJ45 15'	1
11	622-001-756	ASSY FURNACE BYPASS LEAK CHECK CN/FP	1
12	625-602-215	ASSY CONNECTOR 02 OUTLET GAS	1
13	633-103-225	TUBE BOROS FILTER W/SLEEVE	1
14	709-806-720	POWER CORD ASSEMBLY	1
15	780-844	ASSY HOSE VESSEL PRESSURE	1

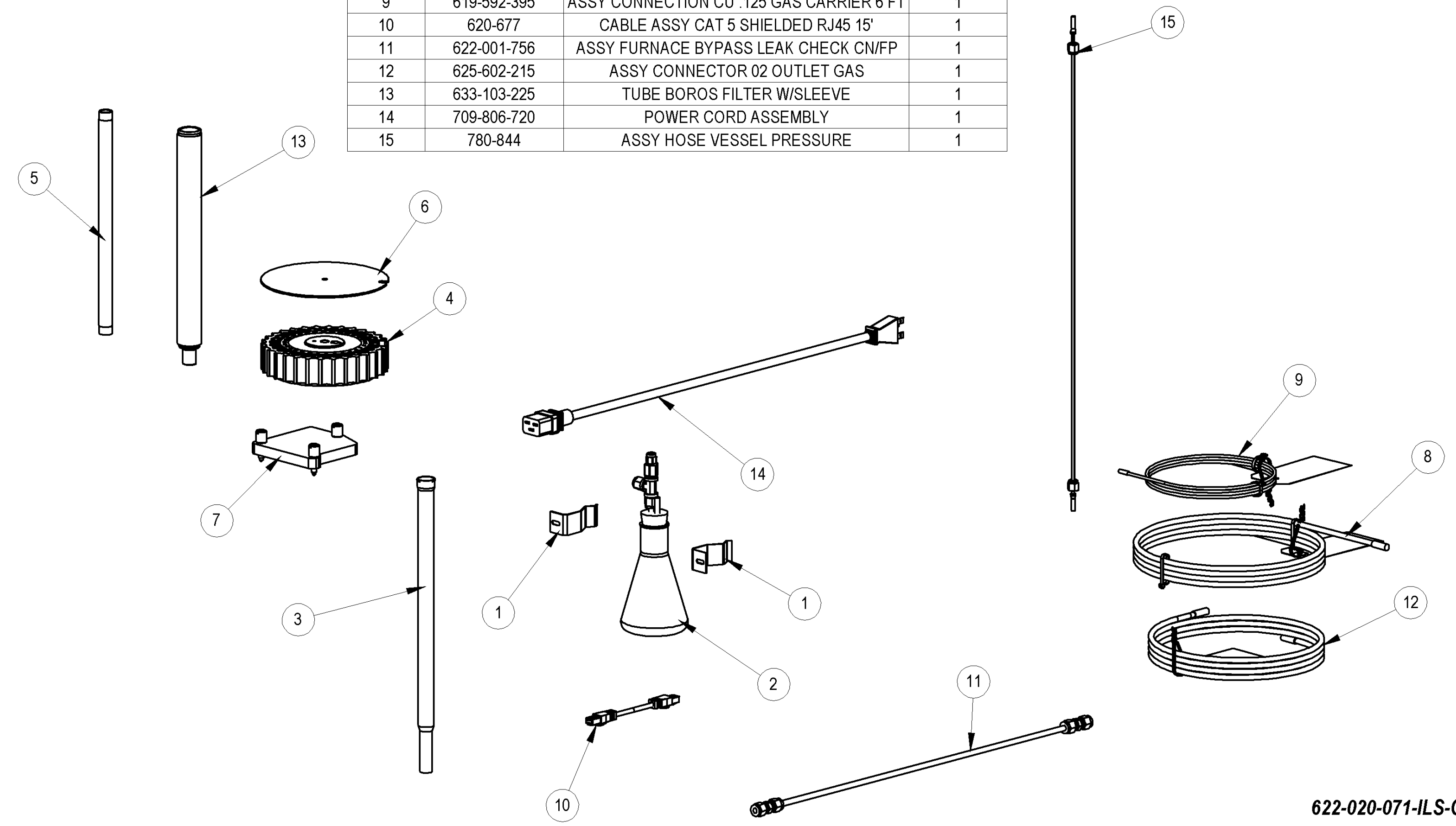


Figure 10-75
Component Pack FP628

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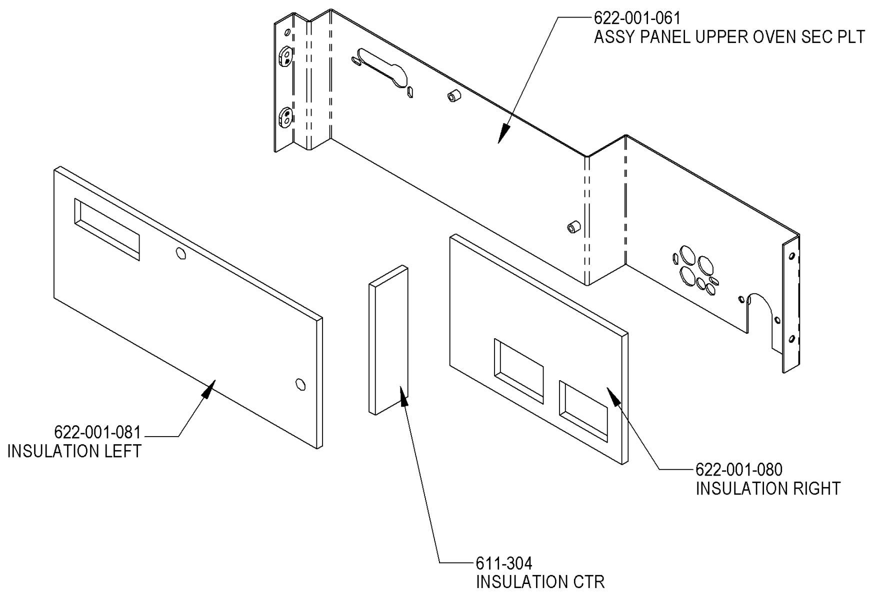


622-001-629-ILS - C
SHEET 1 OF 2

Figure 10-76
Upper Oven Wall Assembly 1 of 2

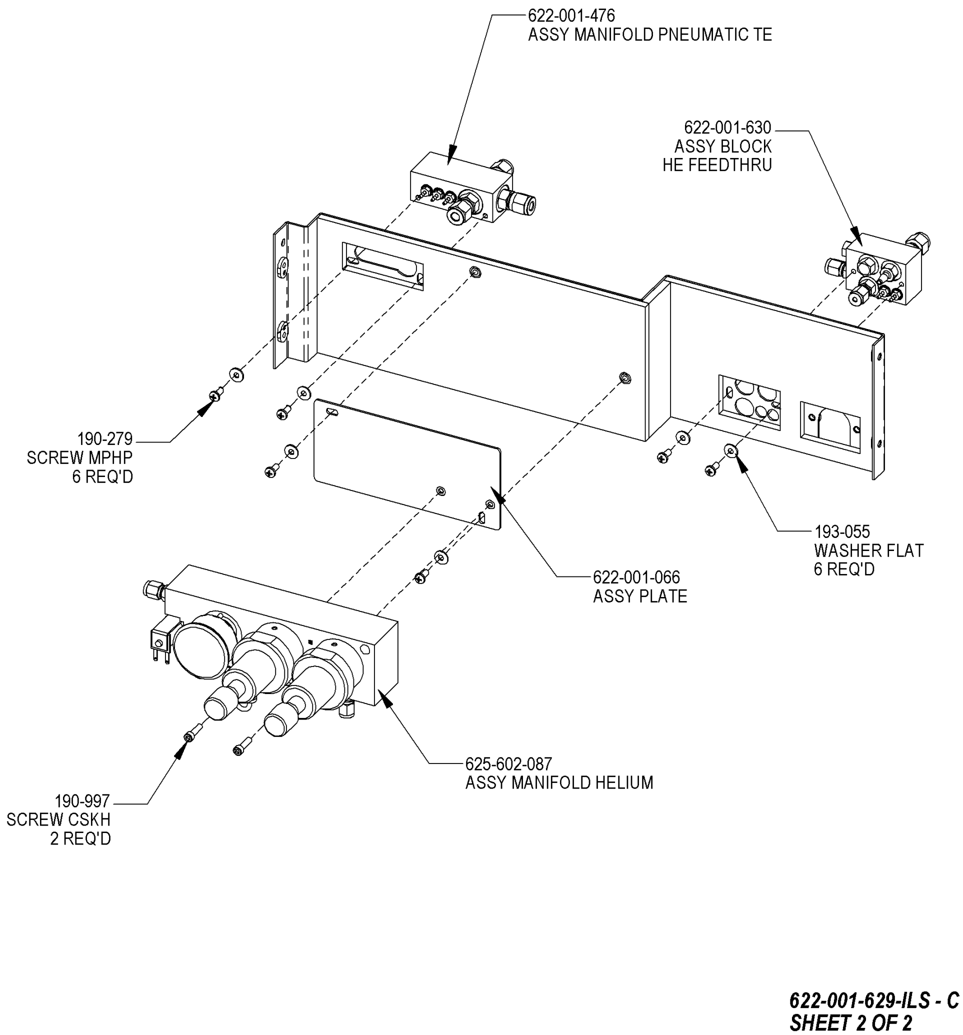


Figure 10-77
Upper Oven Wall Assembly 2 of 2

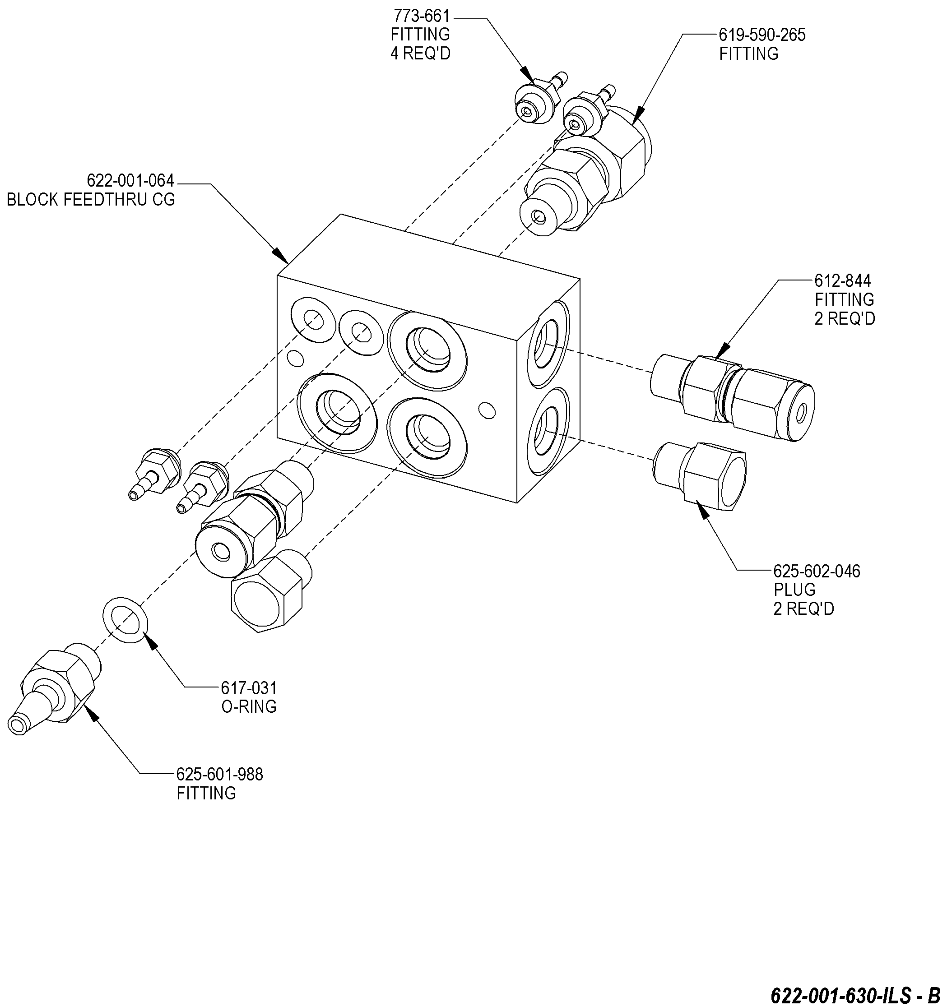


Figure 10-78
Doser Ballast Block Assembly

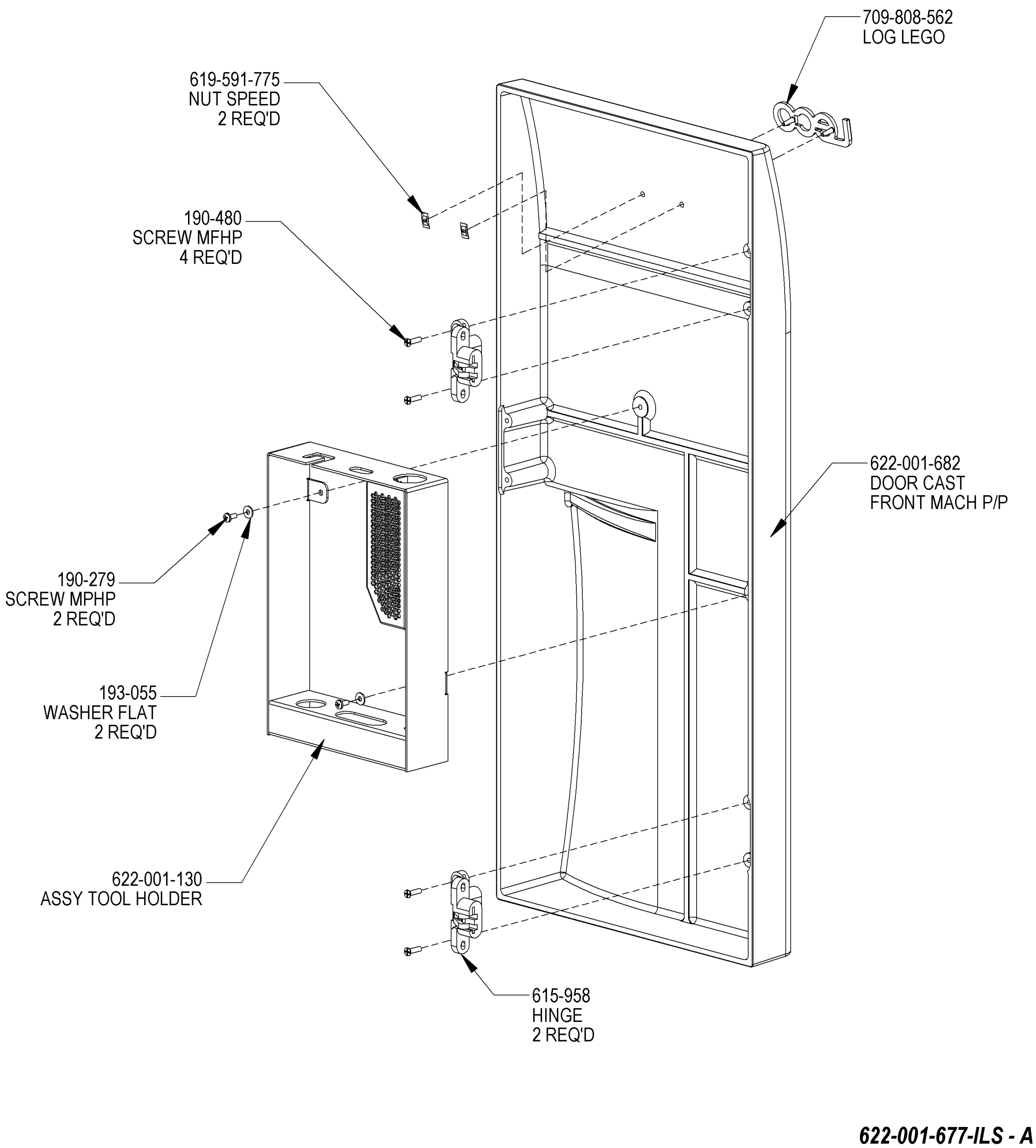


Figure 10-79
Furnace Front Door Assembly

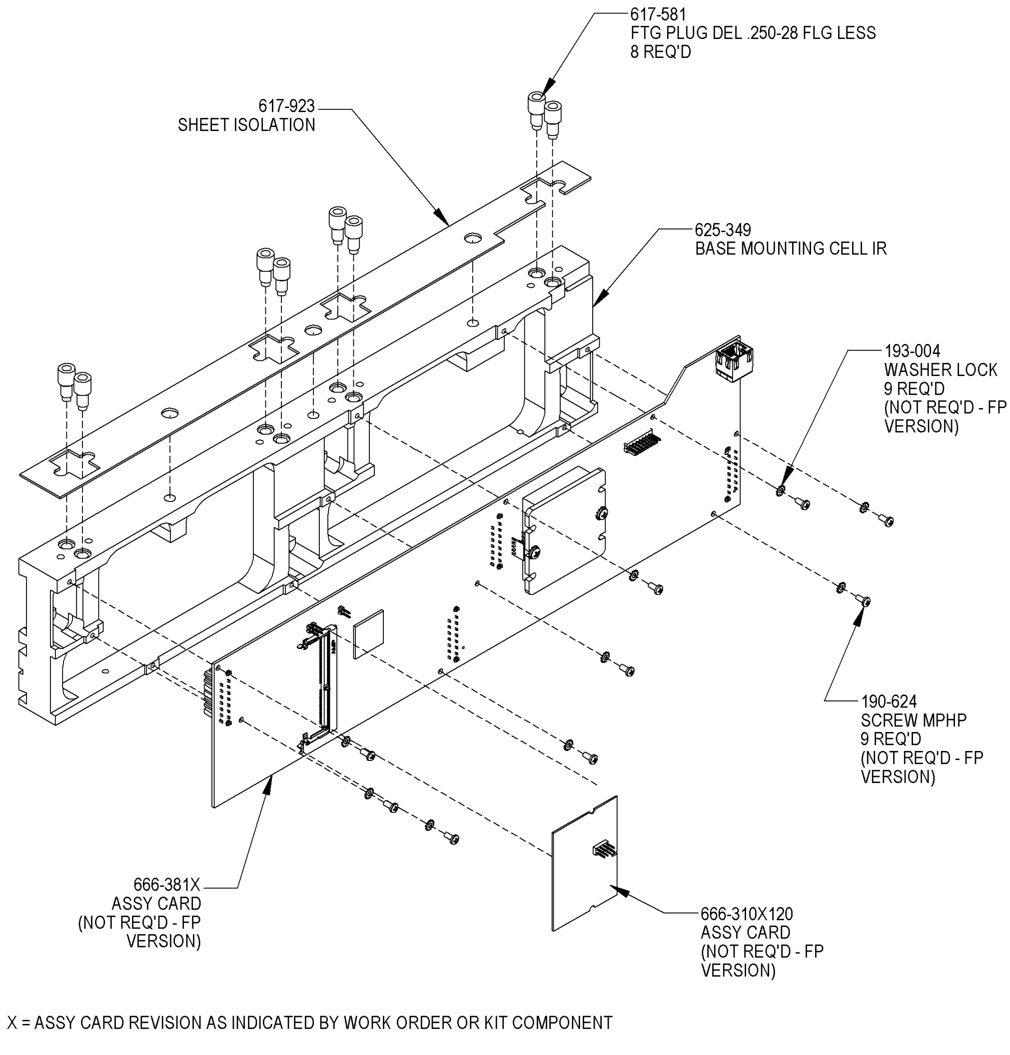


Figure 10-80
Oven Cell 628 Series Assembly 1 of 7

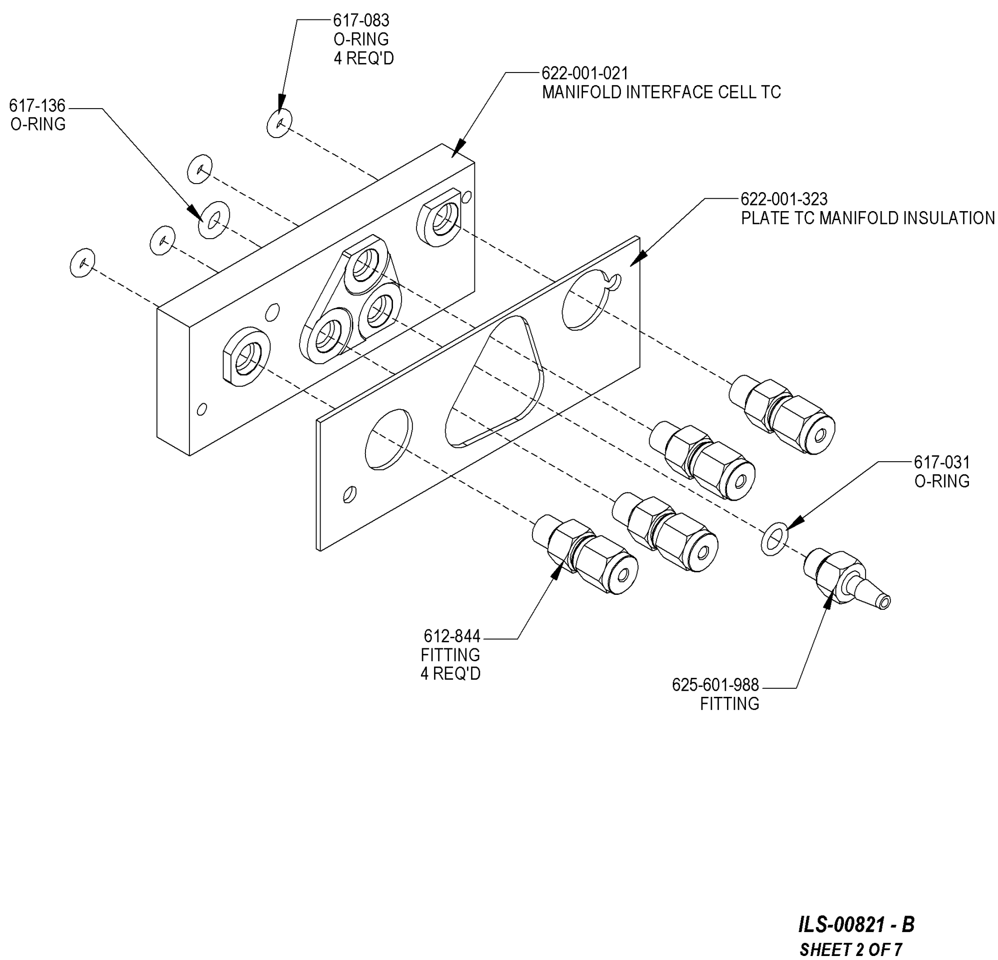


Figure 10-81
Oven Cell 628 Series Assembly 2 of 7

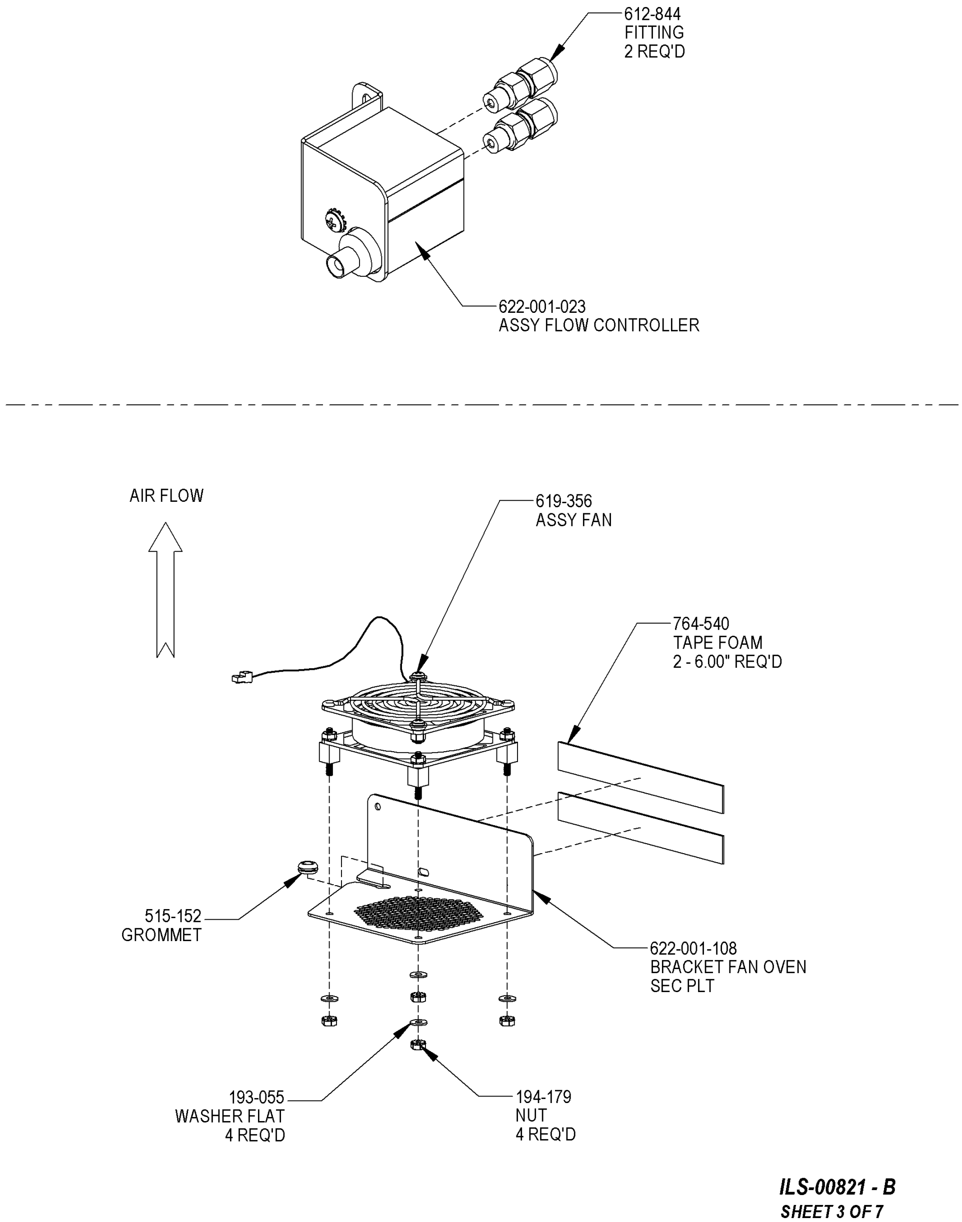
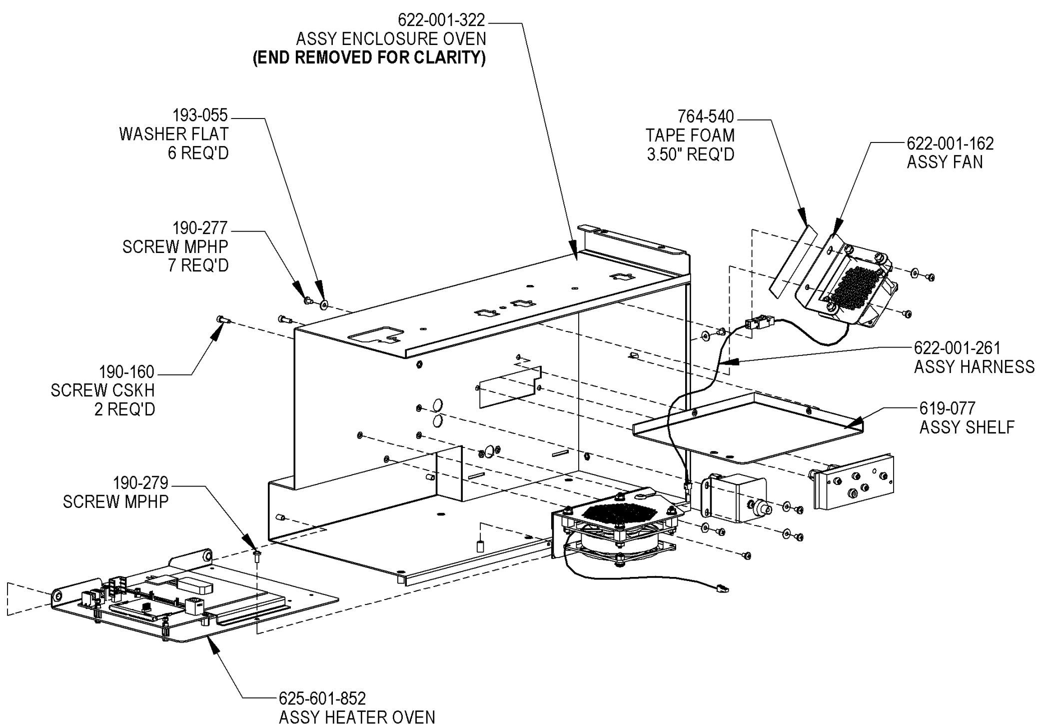
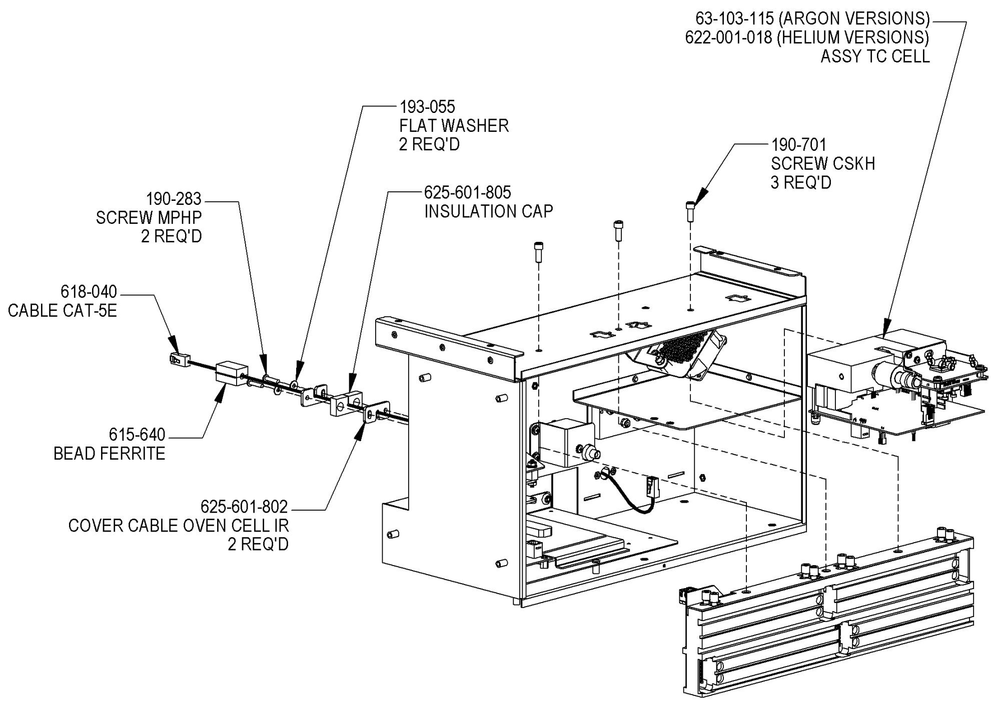


Figure 10-82
Oven Cell 628 Series Assembly 3 of 7



ILS-00821 - B
SHEET 4 OF 7

Figure 10-83
Oven Cell 628 Series Assembly 4 of 7



ILS-00821 - B
SHEET 5 OF 7

Figure 10-84
Oven Cell 628 Series Assembly 5 of 7

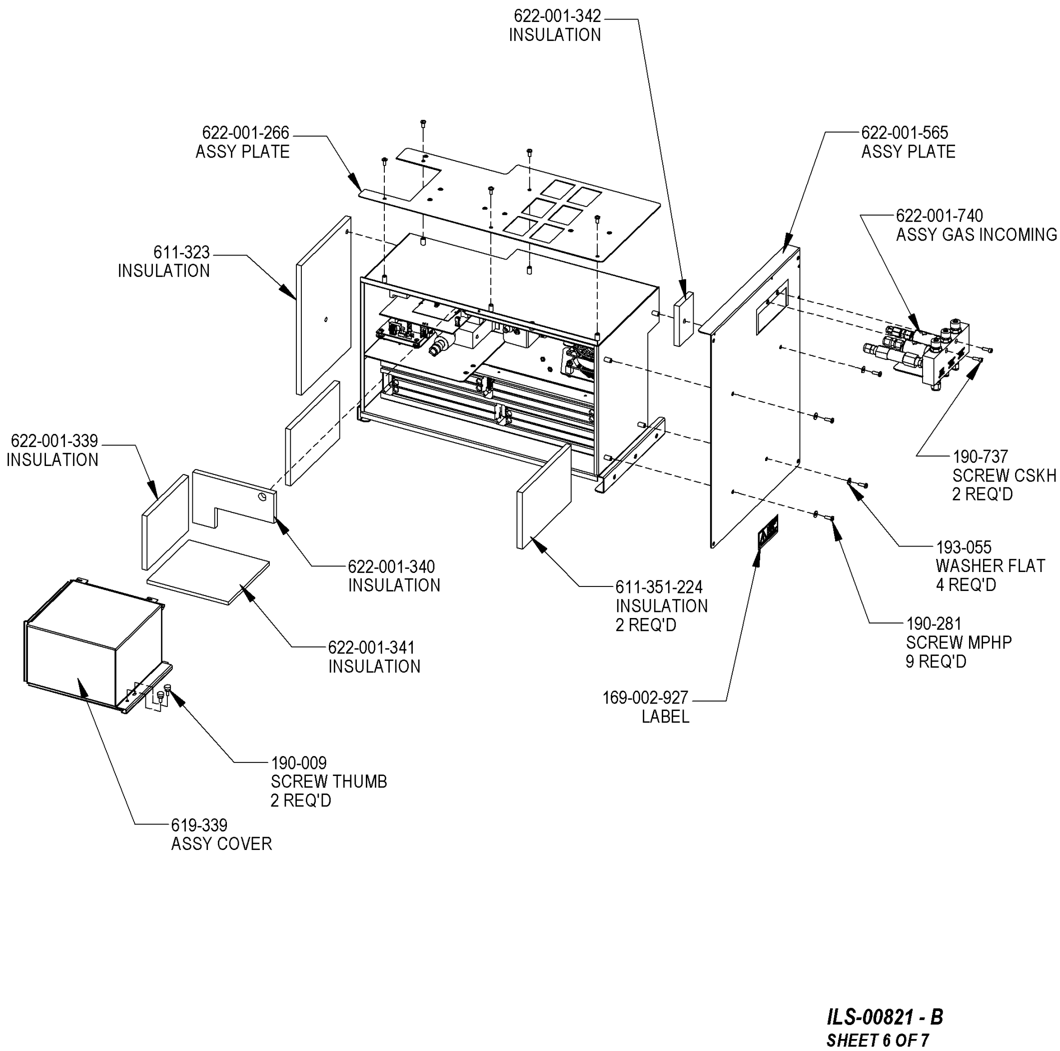


Figure 10-85
Oven Cell 628 Series Assembly 6 of 7

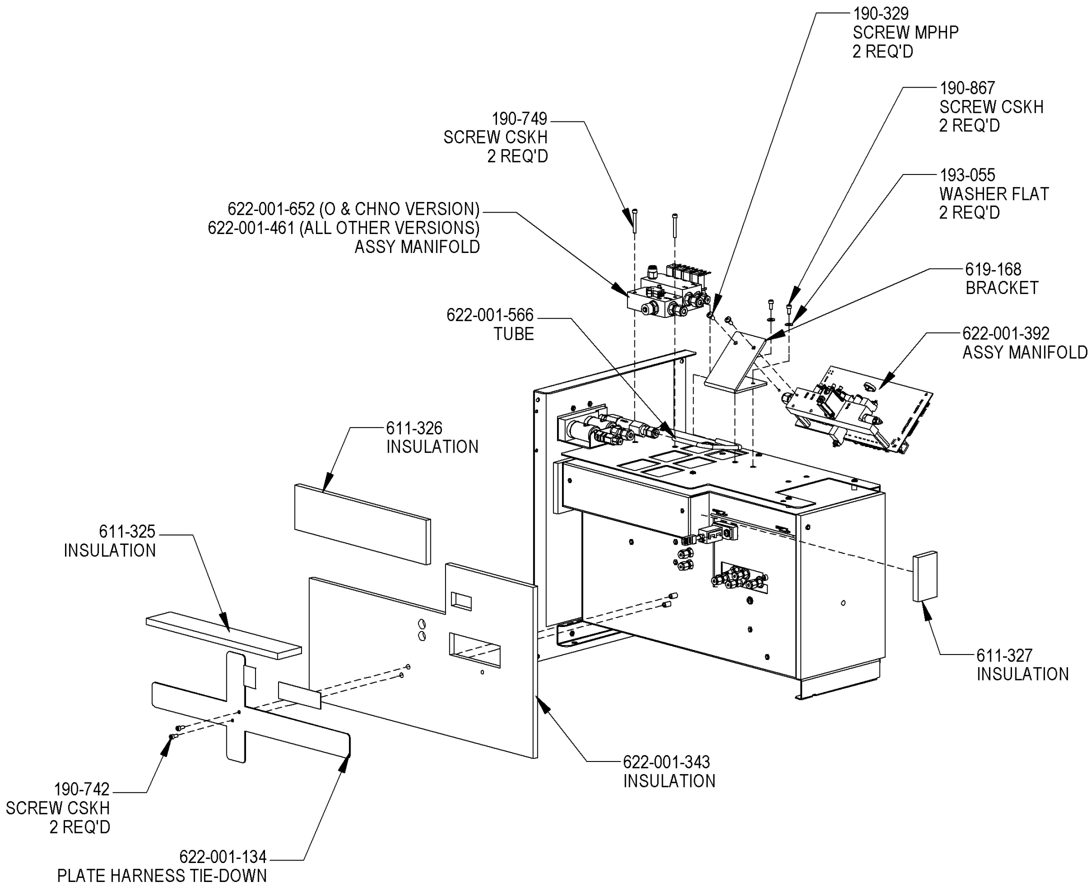


Figure 10-86
Oven Cell 628 Series Assembly 7 of 7

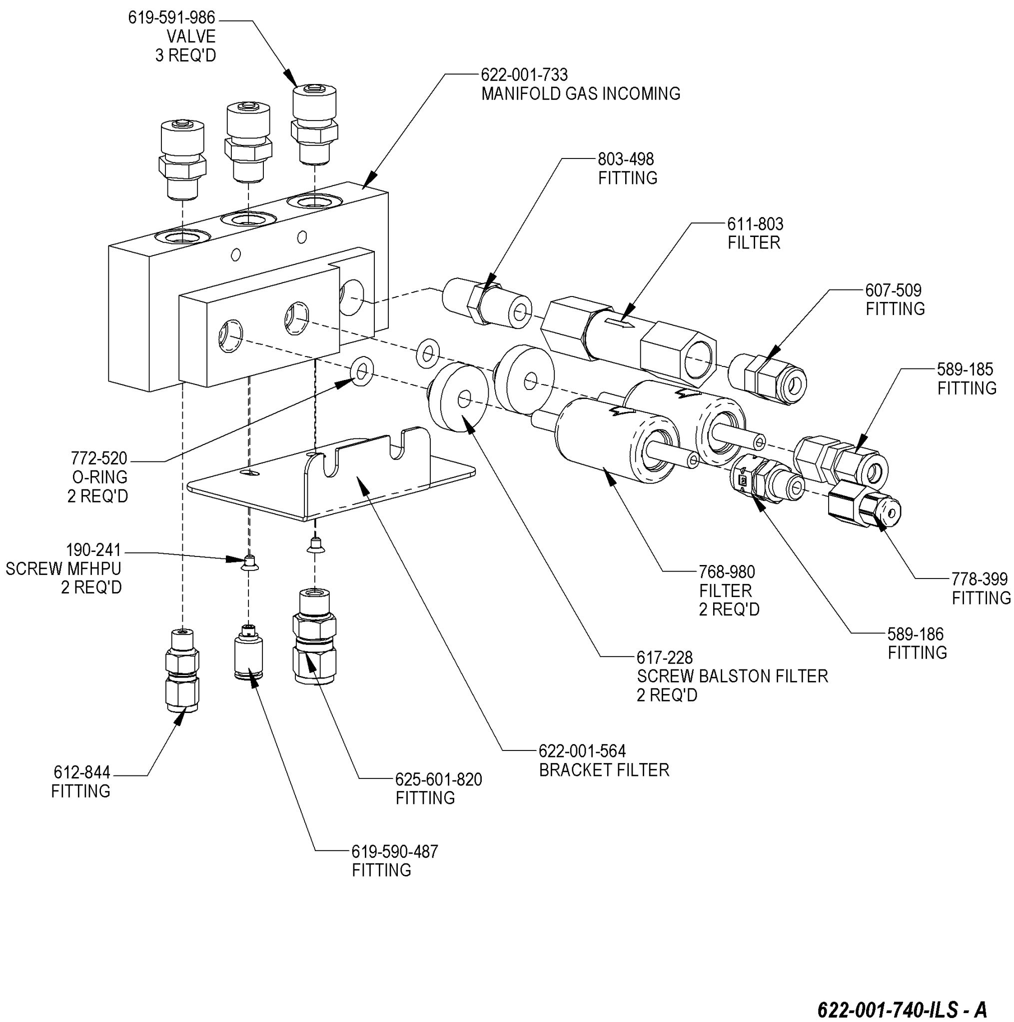


Figure 10-87
Incoming Gas Manifold Assembly

622-020-010-ILS ASSY FP628 UNIQUE SUB

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	619-316	TUBE FILTER GLASS EXTENDED USE	1
2	622-001-093	TUBE DOSER PORT B TO REA TUBE HTR TOP MANIF	1
3	622-001-253	ASSY COOLER TE W/HOUSING	1
4	622-001-332	SHROUD FURNACE FP628	1
5	622-001-390	NAMEPLATE ID 622-000-200 FP628	1
6	622-001-477	ASSY MANIFOLD FEEDTHRU TE	1
7	622-001-629	ASSY WALL UPPER OVEN SEC TE	1
8	622-001-741	ASSY OVEN CELL FP628	1
9	622-001-753	ASSY MANIFOLD TUBE FILTER UPPER_.25" FURNACE EXHAUST	1
10	660-013-058	ASSY FURNACE DUAL W/CAP 1/4 TUBE	1

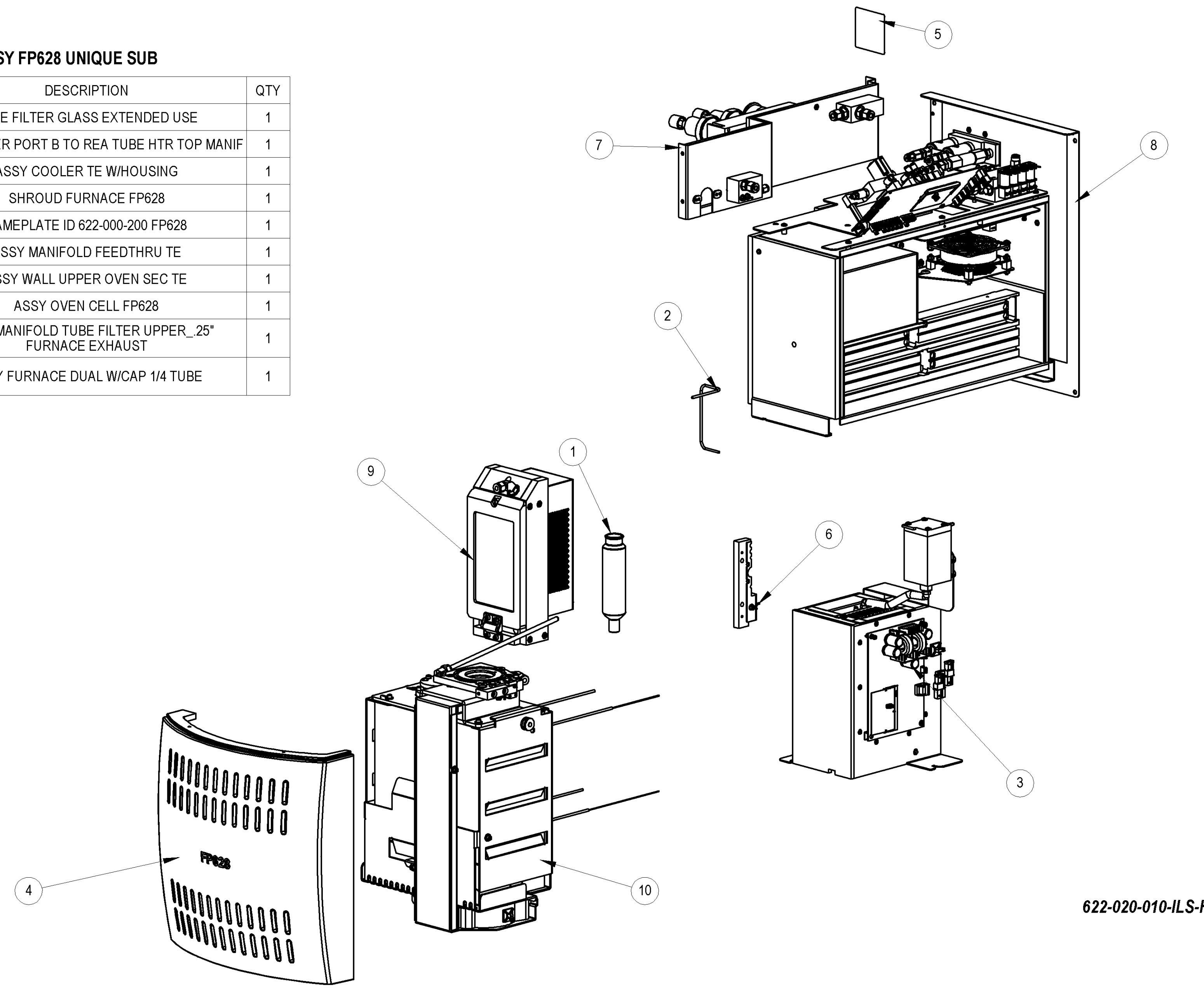


Figure 10-88
FP628 Unique Subassembly

622-130-010-ILS ASSY FP628 ARGON UNIQUE SUB

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	619-316	TUBE FILTER GLASS EXTENDED USE	1
2	622-001-093	TUBE DOSER PORT B TO REA TUBE HTR TOP MANIF	1
3	622-001-253	ASSY COOLER TE W/HOUSING	1
4	622-001-332	SHROUD FURNACE FP628	1
5	622-001-477	ASSY MANIFOLD FEEDTHRU TE	1
6	622-001-629	ASSY WALL UPPER OVEN SEC TE	1
7	622-001-734	NAMEPLATE ID 622-100-300 FP628	1
8	622-001-738	ASSY OVEN CELL FP628 ARGON	1
9	622-001-753	TUBE FILTER 1 BOTTOM TO PRECOOLER TOP	1
10	660-013-058	ASSY FURNACE DUAL W/CAP 1/4 TUBE	1

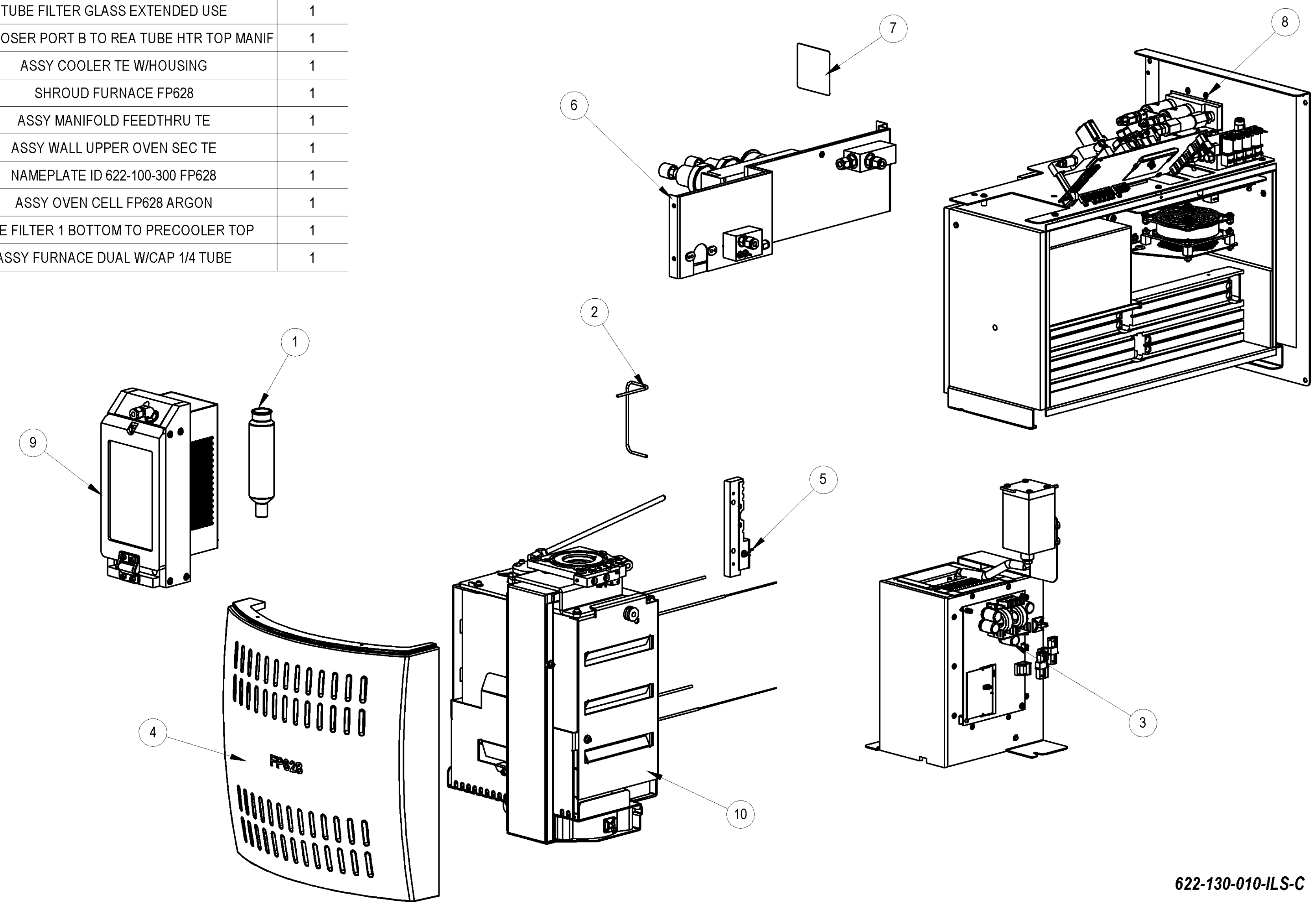


Figure 10-89
FP628 Argon Unique Subassembly

622-050-010-ILS ASSY FP628 W/SULFUR UNIQUE SUB

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	617-565	PIN MOUNTING IR SST	2
2	617-570	INSULATION COVER IR CELL	1
3	619-316	TUBE FILTER GLASS EXTENDED USE	1
4	619-397	INSULATION CAP	1
5	619-590-265	FTG ADPTR SS .250T X 5/16-24 M/S	2
6	622-001-093	TUBE DOSER PORT B TO REA TUBE HTR TOP MANIF	1
7	622-001-107	ASSY MANIFOLD CO2 IR CELL O2 FURNACE	1
8	622-001-253	ASSY COOLER TE W/HOUSING	1
9	622-001-332	SHROUD FURNACE FP628	1
10	622-001-432	NAMEPLATE ID 622-000-500 FP628S	1
11	622-001-477	ASSY MANIFOLD FEEDTHRU TE	1
12	622-001-629	ASSY WALL UPPER OVEN SEC TE	1
13	622-001-742	ASSY OVEN CELL	1
14	622-001-753	ASSY MANIFOLD TUBE FILTER UPPER_.25" FURNACE EXHAUST	1
15	625-345	ASSY CELL IR SO2 6.00	1
16	660-013-058	ASSY FURNACE DUAL W/CAP 1/4 TUBE	1
17	772-738	O-RING 010 .239X .379X.070V	2

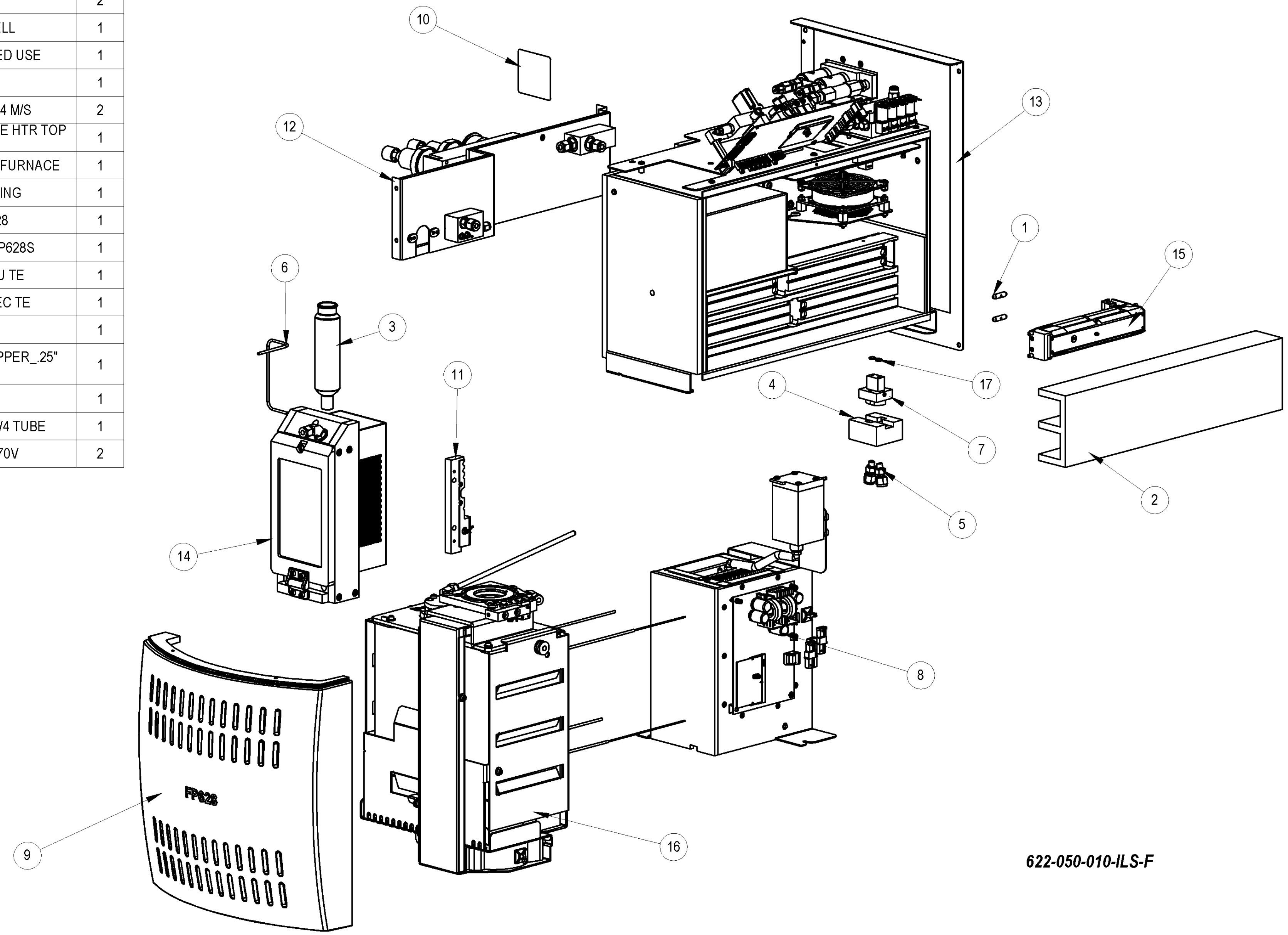


Figure 10-90
FP628 Unique Subassembly

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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.

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Name: 151035
Location: TOP-TopTop
Module Sheet 2
4
DISTRIBUTION & POWER ENTRY
WIRING HARNESSES
H1
619-318
WIRING_HARNESS
AC_SUPPLY
H2
619-782
WIRING_HARNESS
DC_SUPPLY
H3
622-001-605
WIRING_HARNESS
PNEUMATIC
H4
619-231
WIRING_HARNESS
LOAD_HEAD
H5
622-001-307
WIRING_HARNESS
AC_POWER
H6
622-001-308
WIRING_HARNESS
DC_POWER
H7
625-601-621
WIRING_HARNESS
PV_PLATE_BALLAST
H8
622-001-261
WIRING_HARNESS
JUMPER_FAN
H9
622-001-347
WIRING_HARNESS
ECLIPSE
H10
622-001-368
WIRING_HARNESS
BALLST_FAN
H11
619-110
WIRING_HARNESS
TE_COOLER
H12
619-230
WIRING_HARNESS
LOAD_HEAD
H13
622-001-369
ASSY_CABLE
HEATER
H14
622-001-375
ASSY_CABLE
POWER_HEATER
H15
622-001-388
ASSY_CABLE
JUMPER_PV2
H16
622-001-018
ASSEMBLY
TC_CELL
ETHERNET
TO PC
A40
ETHERNET
620-677
666-573X
ETHERNET-CAN_BRIDGE
A2
J573B
ETHERNET
J573C
ECLIPSE
A2A
666-310X210
ECLIPSE_ETHERNET
J573A
ECLIPSE
618-044
18"
H2
ECLIPSE DISTRIBUTION
A1
666-512X
J512AP
HOST-IN
HOST-OUT
J512AQ
ECLIPSE
J512B ECLIPSE 618-044 18" H9 ECL_DUAL_HTR_V8 4-B1
J512C ECLIPSE 618-040 36" H9 ECL_DUAL_HTR_V7 4-B7
J512D ECLIPSE 618-044 18" H9 ECLIPSE_IR 4-D1
J512E ECLIPSE 618-040 36" H9 ECLIPSE_TC 4-G1
J512H ECLIPSE 618-044 18" H9 ECLIPSE_TEC 3-F1
J512I ECLIPSE 618-045 54" H9 ECL_PNEUMATIC_FLOW 3-A3
J512J ECLIPSE 618-040 36" H9 ECLIPSE_OVEN F2
J512K
J512P
J512Q
J512R ECLIPSE RJ45-DSUB 625-099 A87
J512S ECLIPSE RJ45-DSUB 625-099 A88
DC POWER IN
J512AL
J512AK
POWER SUPPLY
PS1
619-288
V+ 1
V+ 2
V+ 3
V- 4
V- 5
V- 6
G 7
N 8
L 9
24V
POWER_SUPPLY
H2
H1
GND
J512AJ 1 +24VDC 2 24GND
J512AC 1 +24VDC_IN 2 NC 3 +24VDC_RET
J512AF 1 +24VDC_IN 2 NC 3 +24VDC_RET
J512AN 1 RSENSE+ 2 NC 3 RSENSE-
J512A +24VDC +24VDC 24GND 24GND JF6 H6 RED BL 615-784 FURNACE_BLOWER FAN6
J512F JF7 616-140 FURNACE_ENCLOSURE_FAN_A FAN7
J512G JF8 616-140 FURNACE_ENCLOSURE_FAN_B FAN8
J512M
J512N H6 TEC-24PWR1 TEC-24PWR2 TEC-24GND1 TEC-24GND2 3-G1
J512V JF4 614-724 TOP_CABINET_FAN FAN4
J512W JF5 614-724 BOTTOM_CABINET_FAN FAN5
J512Y
J512AA H6 TEC-24PWR3 TEC-24PWR4 TEC-24GND3 TEC-24GND4 3-G1
J512AB
J512AE
J512AH
J512L 1 AC_HI_A 2 GND 3 AC_LO_A
MOV1 619-001 ANALYZER MOV
J512T 1 AC_HI_A 2 GND 3 AC_LO_A
J512U 1 AC_HI_A 2 GND 3 AC_LO_A
4-C7 A7 H5
4-C7 DUAL_HTR_V7 H5
J512X 1 AC_HI_A 2 GND 3 AC_LO_A
J512Z 1 AC_HI_A 2 GND 3 AC_LO_A
4-C1 A8 H5
4-C1 DUAL_HTR_V8 H5
J512AD 1 AC_HI_A 2 GND 3 AC_LO_A
J512AG 1 AC_HI_B 2 GND 3 AC_LO_B
J512AI 1 AC_HI_B 2 GND 3 AC_LO_B
J512AM 1 AC_HI_B 2 GND 3 AC_LO_B
ECLIPSE_DISTRIBUTION
DETECTOR OVEN
A3A
666-310X120
ECLIPSE_DAUGHTER
J534
A3
J313C
ECLIPSE
666-534X
ECLIPSE_OVEN_CTRL
B11 ECLIPSE_OVEN
J313D FAN_1+ FAN_1- JF3 RED BL 622-001-166 CELL_OVEN_FAN FAN3
J313F FAN_2+ FAN_2- RED BL FAN 619-249 CELL_OVEN FAN10
J313B ACIN_HI GND ACIN_LO
J313 HEATER1- HEATER1+ HTR1 619-221 OVEN_HEATER_1
J313A HEATER2- HEATER2+ HTR2 619-221 OVEN_HEATER_2
POWER ENTRY
LINE_CORD
709-806-720
LC1
230V
615-574
RECEPTACLE
AC1
AC2
GND
J51
PROTECTIVE EARTH GROUND.
THIS GRAPHIC IS TO BE
STAMPED NEXT TO
CONNECTION.
GND
FL1
LINE1 LINE2 GND
LINE_FILTER
LOAD1 LOAD2
20A
610-052
CB1
15A
LINE1 LOAD1
LINE2 LOAD2
MAIN_BREAKER
789-320
CHASSIS GROUND
BASE GROUND
FURNACE HOUSING
622-001-433
BASE GROUND
LECO®
St. Joseph, Michigan USA
Description
Schematic
CHN628 CABINET
Part Number
151-035
Rev E
Date: 06/11/2013:16:10
Type M
Schematic Sheet 2 OF 4

Name: 151035
Location: TOP-TopTop
Module Sheet 3 4

LECO®
St. Joseph, Michigan USA

Description Schematic
CHN628 CABINET

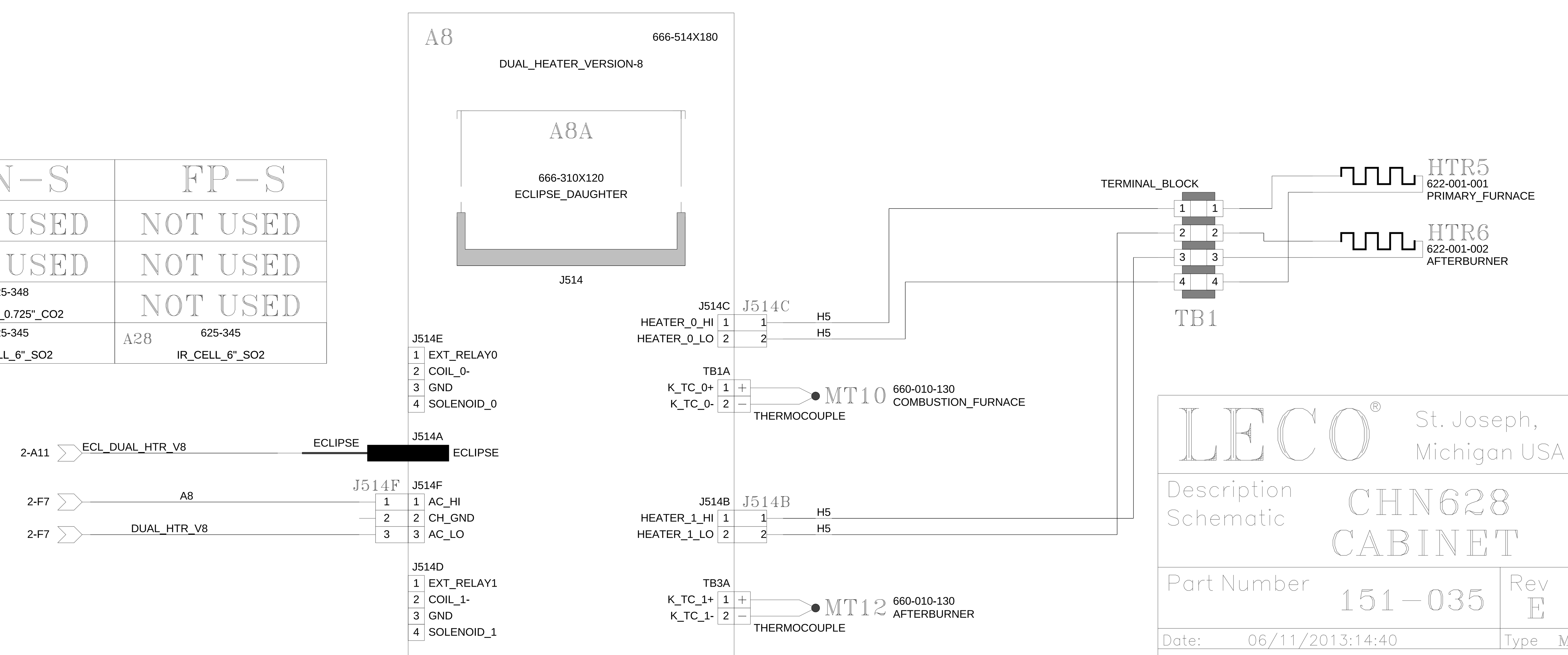
Part Number 151-035
Rev E

Date: 06/11/2013:16:11
Type M

Schematic Sheet 3 OF 4

IR CELLS IN 628 DERIVATIVES

		CHN	CN	FP	CHN-S	CN-S	FP-S
J284A	UPPER LEFT	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED
J284B	LOWER LEFT	A20 625-509 IR_CELL_6"_H2O	NOT USED	NOT USED	A20 625-509 IR_CELL_6"_H2O	NOT USED	NOT USED
J284C	LOWER RIGHT	A24 625-348 IR_CELL_0.725"_CO2	A24 625-348 IR_CELL_0.725"_CO2	NOT USED	A24 625-348 IR_CELL_0.725"_CO2	A24 625-348 IR_CELL_0.725"_CO2	NOT USED
J284D	UPPER RIGHT	NOT USED	NOT USED	NOT USED	A28 625-345 IR_CELL_6"_SO2	A28 625-345 IR_CELL_6"_SO2	A28 625-345 IR_CELL_6"_SO2



LECO® St. Joseph, Michigan USA

Description: Schematic — CHN628 CABINET

Part Number: 151-035 — Rev E

Date: 06/11/2013:14:40 — Type M

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12 Glossary

A

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

Add to End of List: Check to enter the logged-in standard in the last row of the spreadsheet.

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

Ambient Temperature: The ambient temperature inside the instrument as measured by a temperature transducer. This value is in degrees Celsius.

Analysis Date: The date and time the analysis was completed.

Analysis Time: The length of the analysis in seconds.

Analyte: The specific component measured in a chemical analysis.

B

Balance Mode: If a balance is connected to the system, set this parameter to Normal. If there is not a balance connected to the system, set this parameter to Disabled.

Baseline: Electronic line determined as the zero or reference line that is used to differentiate the actual analyte concentration.

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

Baseline Delay Time for Nitrogen: Determines the time period to wait before baseline data after sample gas is dumped into the measurement system from the aliquot loop.

Baud Rate: Sets the data transmission speed in bits per second. Selections: 1200, 2400, 4800, or 9600 bps. Default: 9600 bps

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.

C

Calibration: A comparison of a measurement standard or instrument with another standard or instrument to report or eliminate, by adjustment, any variation or deviation in the accuracy of the item being compared. (Taylor, John K. "Standard Reference Materials Handbook for SRM Users." NIST Special Publication, 260-100, 1993.)

Checksum: A four-digit number unique to the application software and used to verify proper installation. This number will vary between electronic assemblies but is constant between instruments for a given electronic assembly. This number changes with each software update.

Class: A two-digit listing of all different groups of circuit boards that are signed on to the network. Each group will have a distinct class assigned.

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

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 – 100%.

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.

D

Data Bits: Used to select the number of bits per byte for data that will be transmitted. Selections: 5 to 8. Default: 8

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

Device: A list of the various electronic assemblies in the instrument that are connected to the network and monitored by the program.

Dosing: Injecting known volumes of gas into an instrument.

E

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 – 2 seconds.

Equilibrate Time: The time period for gases in the ballast to mix after it is filled.

Equilibrate Pressure Time: The time period to wait once the aliquot loop is filled and isolated to let pressure in the aliquot loop to stabilize.

F

Fill Pressure Drop: Difference in pressure of the full ballast to a chosen pressure for analysis.

Flux: A material that renders refractory impurities more easily fusible and also preferentially combines with such impurities.

Furnace Flow: The furnace gas flow rate. Selections are None, Low, Medium, High, and Maximum. Select to enter the desired flow rate.

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.

I

Instance: A unique number assigned to an electronic assembly that shows how many variations of each electronic assembly are present in the instrument.

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

K

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

M

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

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.

Method: The method used for analysis. Select the Down Arrow to select from the list of methods.

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.

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

N

NI Version: The version number of the software currently being used. This number may vary between circuit boards but is constant between instruments for a given circuit board.

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.

Not Filled Time Out: If the ballast is not filled by the entered time period, analysis will abort. This could be caused by a leak in the system. This time period should be longer than the combined time of the burn steps.

O

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

P

Parity: Sets the method of error checking used. Selections: Even, Odd, or None. Default: Even

Poll Devices: Determines which electronic assemblies are signed on to the network.

Port: Areas on the exterior of the PC tower into which peripheral devices, such as a printer or a mouse, can be plugged.

Print: Select Print to receive a printout of the system configuration settings from the system printer. These may be saved for future reference.

Protein Factor: The value used to calculate a protein result based on a nitrogen analysis. This is an optional entry.

R

Readability: The smallest increment of weight displayed. Determines the number of digits that will display from the balance results.

Recalculated Date: The date when an analysis is recalculated. Until an analysis is recalculated, this column will display the same data as the Analysis Date column.

S

Sample Moisture: Moisture should be entered as-Determined or as-Received.

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

Sample Size: Selects the mode of operation: macro-analysis or microanalysis. The macro-analysis range is 50 mgs to 1.0 gram, and the microanalysis range is up to 50 mgs. Select the range that corresponds to the expected sample analysis result.

Send Command: The command sent from the instrument that the balance reads to send and enter the weight in the spreadsheet. Default: <ESC>P<CR><LF>

Serial Number: 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.

Significant Digits: The digits required to represent the accuracy of an approximate number beginning with the leftmost non-zero digit and ending with the rightmost non-zero digit (or a zero considered to be the exact value). For example: 0.132 has three significant digits and 3.142 has four significant digits.

Standard: Determination of analyte concentration by several laboratories utilizing more than one technique when applicable.

Standard Deviation: A measure of how precise the average is - how well the values agree.

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

T

Tare Command: The command sent from the instrument that the balance reads to set the weight displayed on the balance to zero. Default: <ESC> T

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

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.

U

Uncertainty: The range of values within which the true value is estimated to be. It is the best estimate of the possible inaccuracy due to both random and systematic error. (Taylor, John Keenan. Statistical Techniques for Data Analysis. Lewis Publishers, Inc.: Chelsea, Michigan. 1990)

V

Version: The number of the application firmware located on the electronic assembly. This number can vary between electronic assemblies but is constant between instruments for a given electronic assembly.

Volatize: Change from solid or liquid to gas at relatively low temperatures and pressures.

W

Weighting: Displays a factor manually entered by the user to weight a particular calibration point. When one calibration point is assigned a higher value than other calibration points, that point is considered more important and is therefore favored by the calibration curve.

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